

**REVIEW OF THE FEDERAL GOVERNMENT'S
RESEARCH PROGRAM ON THE CAUSES AND
EFFECTS OF ACID RAIN**

HEARING
BEFORE THE
COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
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FIRST SESSION

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REVIEW OF THE FEDERAL GOVERNMENT'S RESEARCH PROGRAM ON THE CAUSES AND EFFECTS OF ACID RAIN

WEDNESDAY, DECEMBER 11, 1985

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The committee met, pursuant to notice, at 10:10 a.m., in room 406, Dirksen Senate Office Building, Hon. Robert T. Stafford (chairman of the committee) presiding.

Present: Senators Stafford, Simpson, Symms, Burdick, Hart, Moynihan, Lautenberg, Mitchell, and Baucus.

OPENING STATEMENT OF HON. ROBERT T. STAFFORD, U.S. SENATOR FROM THE STATE OF VERMONT

Senator STAFFORD. The committee will please come to order.

Good morning, and welcome to the hearing. The subject of this morning's hearing is the Federal Government's research program on the causes and effects of acid deposition, which we commonly call acid rain. This research program was formally initiated 5 years ago through the enactment of Federal law, but it has been an ongoing informal program for more than 10 years.

The purpose of this research program is to provide the Congress with a complete and trustworthy supply of information. I suppose that should go without saying, but I nevertheless feel compelled to make that statement explicit because there may be some misunderstanding regarding, not only the reasons for this morning's hearing, but this committee's pursuit of legislation to control acid rain.

The chairman of this committee is also privileged to serve as the senior Senator from the State of Vermont. Because Vermont is one of the States perceived to be at the greatest risk because of acid rain, there may be some misconception regarding my motives in connection with this legislation. Many persons are aware that when I sought reelection in 1982, I took pains to make the voters of Vermont aware that as chairman of the Environment and Public Works Committee I was in a position, I hoped, to influence the enactment of legislation to control acid rain, but I was not motivated then and I am not motivated now to enact a program on the basis of false or misplaced conceptions regarding the facts. My pursuit of legislation on this subject proceeds from a conviction that it is a very real and present threat to the health and environment of not only the United States but the North American Continent generally.

It is undoubtedly true that this Senator's awareness of the problem is heightened by the fact that Vermont may be especially at risk, along with northern New England, but the fundamental truth remains that I am seeking legislation which proceeds from hard facts and reality, not political ambition. It has been a tenet of this Senator for the 25 years he has served in the Congress, that good government is good politics, and that decisions made on the facts are the foundations of good government. This issue, in my judgment, is no different.

This hearing has been scheduled because it is time to review the research and assessment program of the Federal Government to determine whether it is providing the facts needed to make proper decisions on acid rain legislation. As a general rule I am not a proponent of subdividing research programs into tidy boxes. This tends to give the impression that information comes in conveniently organized bundles that can be packaged, wrapped, and placed under the Christmas tree, then unwrapped just in time to reveal the truth we have all been seeking. In fact, research we know is a tedious process that almost invariably fails to reveal as much information as the public, the Congress, or the executive branch would like. It should neither begin at some magic date nor should it end on one. Most importantly, it should have as a single-minded and unwavering goal the discovery and truthful characterization of the facts which are revealed or organized in a way that makes them understandable.

The purpose of this hearing is to determine whether this research program is, and has been, conducted in that way. Having, I hope, made this Senator's objectives clear, I would ask if my colleagues have any opening statements. If not, we will begin the hearing. I am not aware of how we came in this morning but, Senator Hart, you were here, so I invite you to make a statement.

OPENING STATEMENT OF HON. GARY HART, U.S. SENATOR FROM THE STATE OF COLORADO

Senator HART. Mr. Chairman, thank you very much.

I first became aware of the dimensions of the acid rain problem in this country over 6 years ago as chairman of the National Commission on Air Quality, a commission which made preliminary recommendations not only about acid rain but a lot of other air quality control issues which have been largely ignored, unfortunately, for the past 5 years. In any case, my interest in this subject now extends to the fact that this has largely been considered an Eastern phenomenon. There are, in fact, beginning to be serious acid rain problems in the West. In fact, out there it's better to say acid precipitation. We have acid snow, acid fog, and even dry depositions which are coming to be known as acid dust. We have a serious problem with smelters from the Southwestern part of the country and even from Mexico.

With the chairman's permission, I held a hearing sponsored by this committee in Denver in August. We had considerable testimony from Government and private witnesses about the increasing impact of all this acid deposition on our ecology in that area. Unfortunately, my understanding is that the EPA has focused most of

its attention—its early attention, and it is very early and very preliminary—on impact on commercial timbering, when in fact there are substantial indications of serious damage being done to high mountain lakes and waterways and so forth.

So I am pleased to have the Administrator here with us and to hear what he has to say. Research is important, but if this Government waits until we have perfect knowledge, we will never get anything done. I think at some point we are going to have to move from research to action, and I hope that will be fairly soon.

Senator STAFFORD. Thank you very much, Senator Hart.

Senator Moynihan.

Senator MOYNIHAN. Mr. Chairman, I have a statement I would like to put in the record and a brief opening remark or two.

Senator STAFFORD. Without objection, your statement will be placed in the record.

**OPENING STATEMENT OF HON. DANIEL PATRICK MOYNIHAN, U.S.
SENATOR FROM THE STATE OF NEW YORK**

Senator MOYNIHAN. And I would make two brief observations. I introduced the Acid Precipitation Act of 1979, which is the legislation that we are considering here today. At the time there was very little awareness of acid rain—acid precipitation, as Senator Hart says. It was something known to ecologists in certain parts of the country—not many. There had been work done at Cornell on fish damage in the Adirondacks. There was some work done in Canada. Canada was being particularly concerned by just the measurement problem.

A rather interesting fact, if I may say, that for all the extraordinary measurements and attention paid to the forest preserve in New York State, which is sort of the original national forest, they never measured the acid content of the lakes so they don't have any baselines. There was some work done in Europe, but by and large there was very little awareness of the issue here, and I guess I would have to say, had there been any awareness of the issue in the Congress, I don't think even the modest bill that I proposed would have been enacted, as we have learned since.

But it did seem a responsible thing to say, "Let us learn as much as normal science can produce on the subject before we go further." Interest in the subject has moved ahead faster than the research results, I think, but one of our concerns is whether this is simply a result of the way issues win public attention or whether or not the research has been slower than it need be.

We set in process a research program. We expected it to take time. We expected it to be rigorous, but we begin to have the feeling—and I would like to hear from the gentlemen here—that it is becoming not so much rigorous as restrictive, and that that data that doesn't come in at 99 percent of statistical significance or 95 or whatever—even so, useful data, it shows trends, it shows findings that are beginning, possibly, to emerge—this is being excluded from the reports in a way that we find difficult to understand, and also that we find and begin to hear from other scientists that they are being kept away from data which they might find useful in their own just reinterpreting of a very common phenomenon.

I won't go beyond that, Mr. Chairman. We have others to speak, and we want to hear, but I would like to make a point: This is my legislation, and I have some sense of science work. I was a member of the President's science advisory committee and a member of the board of the American Association for the Advancement of Science. I respect rigor; I dislike delay; but I begin to suspect something less scientific and more political.

[Senator Moynihan's written statement, follows:]

OPENING STATEMENT OF HON. DANIEL PATRICK MOYNIHAN, U.S. SENATOR FROM THE STATE OF NEW YORK

When I introduced the Acid Precipitation Act on September 14, 1979, not very many people knew what I was talking about. There had been reports of hundreds of dead and dying lakes in New England, but they were mostly unverified reports of a few private researchers, and I doubt that many in the Senate believed them. To be sure, some of my colleagues realized what we were doing, but most believed that we were asking for a simple study, when Congress accepted a modification of my original proposal as an amendment to the Energy Security Act of 1980. In fact, mine was a major environmental bill—the only acid rain legislation that the Congress has been able to produce to date.

In enacting my proposal, the Congress found and declared that acid precipitation resulting from other than natural sources—

(1) Could contribute to the increasing pollution of natural and man-made water systems;

(2) Could adversely affect agricultural and forest crops;

(3) Could adversely affect fish and wildlife and natural ecosystems generally;

(4) Could contribute to corrosion of metals, wood, paint, and masonry used in construction and ornamentation of buildings and public monuments;

(5) Could adversely affect the public health and welfare; and

(6) Could affect areas distant from sources and thus involve issues of national and international policy.

The purpose of the Act was not at all a modest one. It included identification of the causes and sources of acid precipitation, evaluation of the environmental, social and economic effects of acid precipitation, and taking such actions as we could on the basis of that information. Half a decade has passed, and much has been learned—but little could we imagine the path the Administration would choose for the National Acid Precipitation Assessment Program, NAPAP, the long-term research program established by the Act.

As implemented by this Administration, NAPAP has gone to extraordinary lengths to ensure that its scientists produce only the best of work; no program receives more careful peer review by the scientific community. Only the results that pass such muster are forwarded to the member agencies of the Interagency Task Force on Acid Precipitation—or the groups that have taken on their duties.

This system takes advantage of the best motivations and skills of our scientists—in both the best and worst senses of the phrase. Only good science is produced, but good science means reaching only those conclusions about which we can be fully confident—a 5 percent or at most 10 percent chance of error is acceptable. Apparent trends in the data, which probably are real but stand one chance in 3 or 4 or 5 of being illusory, are by definition not "statistically significant," and will not be reported to policy makers by NAPAP's researchers. As a practical matter, this means that very little of the information available to the scientists is ever presented to the rest of us.

It is proper for scientists to say, as they usually do, "this is what we are nearly sure of." It is also proper—and necessary—for the scientists who study rain for NAPAP to say "and we also see these trends, which probably are true, although we may be wrong." Scientists can afford to insist on 90 percent certainty; the Congress cannot always afford such certainty. Neither can the public. If it appears substantially more likely than not that acid rain harms lakes, or kills trees, or harms us or our homes, it may be time to act, even if detailed studies have not yet produced detailed proof.

The Administration has encouraged—indeed required—scientists to do their best. By doing so, however, they have made it highly unlikely that either they or we will ever get sufficient information to develop sound policies to control acid rain. Indeed, they have gone farther—access to raw data and preliminary results from NAPAP

research has been denied to competent researchers outside the program—and to the staff of this Committee. I see a disturbing trend towards barring the scientists who have the information from doing meaningful assessments, and barring others who might do the assessments from obtaining complete information.

By limiting the flow of information to policy makers to *only* the most conservative results, the Administration assures that we shall not have enough evidence to compel action. This is not the intent of my bill, it is not what the Congress wrote into law, and the Administration should not be doing it.

**OPENING STATEMENT OF HON. FRANK R. LAUTENBERG, U.S.
SENATOR FROM THE STATE OF NEW JERSEY**

Senator STAFFORD. Thank you, Senator Moynihan.

Senator Lautenberg.

Senator LAUTENBERG. Thank you, Mr. Chairman.

Under the Acid Precipitation Act which Congress created at the beginning of the decade, we created an interagency task force to carry out a 10-year comprehensive research and assessment program on acid rain. After 2 years, the task force presented Congress with the National Acid Precipitation Assessment Program [NAPAP]. Now, according to the plan, an integrated, policy-related assessment was to be completed by 1987, updated by 1989.

I agree, as others have said, that a well-designed continuing research is a necessary part of any strategy that Congress might choose to address the problem of acid precipitation. My concern is, what progress has been made by NAPAP in developing criteria for the research priorities and implementing high-quality, short-term, long-term research projects that will provide the kind of information that the Congress needs to have.

Of particular concern to me are the effects of acid rain on human health and on the deterioration of materials. My concerns focus on the direct adverse health effects of the sulfate precursors of acid rain and the indirect adverse health effects of acid rain leaching materials and toxic substances, and on the effects on building materials and other structures.

Mr. Chairman, my compliments on getting this overdue review hearing going, and I hope that we will be able to have a chance to get some of the answers to problems that concern each one of us.

Senator STAFFORD. Thank you, Senator Lautenberg.

Senator Mitchell.

**OPENING STATEMENT OF HON. GEORGE J. MITCHELL, U.S.
SENATOR FROM THE STATE OF MAINE**

Senator MITCHELL. I thank you, Mr. Chairman.

I am pleased that we are having this hearing today on the Federal Acid Rain Research Program. This is a necessary and desirable program but it has, unfortunately, become the administration's excuse for inaction on the problem of acid rain. Research is important but it is not enough; action is long overdue.

I hope today that we will hear an answer to a question that I have posed to every EPA Administrator during my term here, and that question is, "If you claim we do not now know enough to act to protect our lakes and our forests from the problem of acid rain, when will we know enough to act?" This program has spent over \$200 million since its inception but, according to the administration, we still don't know enough to act.

I emphasize I am not opposed to further research on acid precipitation, its causes and effects. Indeed, I recognize it as necessary and I support it, but I am disturbed that every EPA Administrator who has testified before this committee on this problem takes refuge in the sanctuary of research. I believe that what information we have been able to obtain through this program confirms that acid precipitation presents a serious environmental problem—a nationwide problem—that places our lakes, our forests, our soil, at risk.

Further research is necessary. It is useful to enhance our understanding of the chemical processes involved, of the causes and effects. This research should supplement, not prevent, action on the problem. We are unfortunately long past the stage when action will prevent any damage from occurring. In vulnerable areas of the country such as the Northeast, it has been demonstrated that our lakes and our rivers have been injured and continue to be assaulted by sulfur and nitrogen emissions as well as other pollutants, and our forests are at risk as well.

I hope, Mr. Thomas, that as you weigh the need for action you will consider carefully the tangible risks of inaction. This Nation, as you perhaps better than anyone know, faces many risks to its environment and to the public health. We cannot solve all of our problems today, this year, or even in this century. What we can do is to begin to solve them. We can put in place controlled programs that will protect generations to come—generations of American citizens, American rivers and lakes, American forests.

The Clean Air Act and the Clean Water Act have already demonstrated beyond any doubt that Federal environmental programs can work if the will is there. I and most of the other members of this committee have the will to control our acid rain problem. I invite you to join us.

Thank you, Mr. Chairman.

Senator STAFFORD. Thank you, Senator Mitchell.

Senator BAUCUS.

OPENING STATEMENT OF HON. MAX BAUCUS, U.S. SENATOR FROM THE STATE OF MONTANA

Senator BAUCUS. I thank the chairman.

Mr. Chairman, we all know this hearing is needed. In fact, it's long overdue. There have been many opportunities where we of this committee have asked the administration why it is not proceeding more quickly, and we have all been very disappointed that the administration has not proceeded more quickly. It is particularly important because, as has been mentioned before, acid rain and the precipitation problem is not only in the Northeast and the New England States, but it also is becoming a Western problem.

We in the West have particular soil conditions, particular geologies—the steepness of our mountains and the pristine nature of our wilderness areas—which are particularly susceptible to denigration and degradation by acid rain. It is important, therefore, that this be recognized as a national problem. It is not just a regional problem. It is very much a national concern. That makes the imminence of the problem that much greater and the importance of addressing the problem that much greater.

A second major point is a very strong frustration with the delay in the program. We are never going to get a perfect solution. Any good manager knows that that management is never going to find the perfect solution in setting up a program. Any good businessman knows that the business is never going to have a perfect solution before it embarks upon a new project. Sure, you have to set up your research programs, you have to market test, but at the very least you have to begin to try something that you think is going to work.

It seems to me that we are long past the time of inaction. Now we are into the mode of trying something, trying to program, and that's the way the program begins to make some sense. I, for the life of me, don't understand why the administration doesn't proceed more quickly. The administration is proceeding very quickly, trying to combat one scourge from the sky, in this SDI. Think of all the research and development and all the program development that this administration wants to put in place with this strategic defense initiative to protect against one big scourge from the sky.

I just don't see why we can't begin to protect ourselves from another scourge from the sky, and that is acid rain. Sure, there has to be some continued research, but at the very least let's begin to put something in place to begin to address the problem, because only then are we going to better know how to address the problem, and we're going to learn a lot more about the sources that cause it.

Mr. Chairman, I hope that with the questions we ask and the information we get here today, that we can begin to finally make some progress. Thank you.

Senator STAFFORD. Thank you, Senator Baucus.

I think it is noteworthy that the members who have spoken thus far this morning indicate their realization that this is a national problem and doesn't center on any one particular part of the country.

Senator Burdick.

**OPENING STATEMENT OF HON. QUENTIN N. BURDICK, U.S.
SENATOR FROM THE STATE OF NORTH DAKOTA**

Senator BURDICK. Thank you, Mr. Chairman.

I agree with you in part, and I am pleased that you have had this hearing this morning. The reason I say I agree with you in part is because it's not a national problem alone, it's an international problem; it's a continental problem. When I say that I want to include our good friends to the north in Canada. The members of this committee know that I have for the last several years made a point that we have to attack this from a continental point of view.

I am pleased with some recent information. I am told that the new Prime Minister of Canada, Byron Mulroney, acknowledged earlier this year that Canada was far behind the United States in emissions control in many significant areas, and that before seeking stronger American controls, Canada must clean up its act first. I would say that we ought to clean it up simultaneously or concurrently, but I am so glad that the Prime Minister has recognized this fact.

We in the northern tier of the country have realized for a long time that the Canadians could have done more. They don't have many scrubbers on their plants, and this realization and the acknowledgment that there is a problem across the border I think is very heartening and will help us in the future.

So I hope that we will take advantage, Mr. Secretary, of their offer; that we will work with them as we work on this problem. I think that for the sake of the continent you can make some progress.

[Senator Burdick's written statement follows:]

OPENING STATEMENT OF HON. QUENTIN N. BURDICK, U.S. SENATOR FROM THE STATE OF NORTH DAKOTA

The State of North Dakota has, for a long time, been interested in the issue of acid rain. Since 1980, it has carried out its own local acid rain research program. The program is jointly funded by the State and the Bureau of Land Management. Unfortunately, last year, due to insufficient funds, the number of monitoring sites were cut in half. The lack of federal funds may in the future jeopardize the entire North Dakota program.

The state program has tried to work with the interagency task force, NAPAP, and the EPA, but both organizations have failed to show any interest in the local research data. This is an intriguing problem, because North Dakota, like other states, already has the database available that these programs are trying to establish. Why spend unnecessary time and money on duplicating studies? There is no reason that the national program cannot utilize local databases in constructing other necessary regional monitoring systems.

In addition, I wonder, of the approximate \$80 million budget for the NAPAP program, why only a small portion is being used to study the West. One might suspect a hint of institutional bias towards the East, yet this is a national program. My primary concern is that the western region needs more attention and testing that is area specific—for example, wilderness studies at high elevations in order to identify specific forest types popular in the West that are in danger of damage caused by acid precipitation.

It is my feeling that we do not know all that we should about the West. I think it is safe to say that there is not the same amounts of acidic deposition in the West as in the East, but then the sensitivity is still there. This point leads to the question of how we are to prevent the problems of the East from happening in the West. What are the future problems for this area? The studies located in the West should be aimed not so much at solving present problems, but in preventing future ones. This should be the primary goal of western acid rain research.

Due to the alkaline soil found in the West, many foresee few serious problems caused by acid rain. But, potential threats do exist in some areas, for example, high elevation forests and low wetlands where the soil contains less calcium and therefore has a lower buffering capacity.

It is important that NAPAP determine the baseline conditions of these areas to ensure protection from damage caused by increased emissions and resulting acidic deposition. Long-term monitoring by NAPAP conducted on unimpacted regions with regional emissions levels to detect any harmful increases appear necessary.

Because of limited funding, this study approach should be set up according to regional priorities and incorporate compatible state baseline data. The goal of this work should be to prevent the West from suffering environmental damage believed to be caused by acid rain not seen in the East.

Senator STAFFORD. Thank you, Senator Burdick.
Senator Symms.

OPENING STATEMENT OF HON. STEVE SYMMS, U.S. SENATOR FROM THE STATE OF IDAHO

Senator SYMMS. Thank you very much, Mr. Chairman.

I am pleased that we're having this hearing. There has been a great deal of consideration and concern about the entire subject of acid rain, and I think rightfully so. I hope we can bring out some of

the factual causes or at least work toward the goal of having a factual understanding of what causes some of the acid rain levels to be as high on the west coast as they are on the east coast, and really what the culpable factors are, whether it's the burning of coal in powerplants or whether it's earthquakes which bring on volcanoes such as El Cajon in Mexico. I have been told by some people that the El Cajon eruption raised the acid rain level in the entire Northern Hemisphere more than all the coal-fired plants that we have had heretofore.

Whether that's true or not, I don't know, so what I would like is for us try to continue to study the question and find out where we're going before Congress makes some legislative endeavor to solve a problem that legislation may not solve, and it may end up being some kind of \$100 billion crap shoot where we just raise taxes on everybody or raise the cost of power production and really have a minimal impact on the problem. If we can come up with what the facts are, then I think we'll have a much better chance of coming up with a possible answer to how to solve the problem.

I hope that this hearing will be helpful to all of us, and I hope we will not stop with this hearing but continue on in a research point of view to isolate and do the best we can to find out what causes the problem. Thank you, Mr. Chairman.

Senator STAFFORD. Thank you very much, Senator Symms.

Mr. Thomas, we are happy to welcome you and your colleagues here. You are well aware of the custom of opening statements, which usually consume at least the first half hour, but the rest of the morning is yours and your colleagues.

STATEMENT OF LEE M. THOMAS, ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY, AND CHAIRMAN, NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM, ACCOMPANIED BY DR. KEITH R. SHEA, ASSOCIATE TO THE DEPUTY CHIEF FOR RESEARCH, U.S. FOREST SERVICE; DR. GEORGE Y. JORDY, DIRECTOR, OFFICE OF PROGRAM ANALYSIS, OFFICE OF ENERGY RESEARCH, U.S. DEPARTMENT OF ENERGY; DR. J. LAURENCE KULP, DIRECTOR OF RESEARCH, NAPAP; DR. JACK PICKERING, CHIEF, OFFICE OF ATMOSPHERIC DEPOSITION ANALYSIS, WATER RESOURCES DIVISION, U.S. GEOLOGICAL SURVEY; DWAIN L. WINTERS, CHAIRMAN, INTERAGENCY POLICY COMMITTEE, NAPAP, AND ACTING DIRECTOR, OFFICE OF PROGRAM DEVELOPMENT FOR AIR AND RADIATION PROGRAMS, ENVIRONMENTAL PROTECTION AGENCY; AND DR. COURTNEY RIOR-DAN, DIRECTOR, OFFICE OF ACID DEPOSITION, ENVIRONMENTAL MONITORING, AND QUALITY ASSURANCE, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. THOMAS. Thank you, Senator. I appreciate the opportunity to be here with you and the committee today with my colleagues, and I would like to introduce those colleagues to you.

Senator STAFFORD. Certainly.

Mr. THOMAS. Starting at my far left is Dr. Keith Shea, who is Associate to the Deputy Chief for Research, Forest Service, U.S. Department of Agriculture.

Next to Keith is Dr. George Jordy, who is Director of the Office of Program Analysis in the Office of Energy Research in the Department of Energy.

On my immediate left is Dr. J. Laurence Kulp, who is Director of Research for the National Acid Precipitation Assessment Program.

On my far right is Dr. Jack Pickering, who is Chief of the Office of Atmospheric Deposition Analysis, Water Resources Division, in the U.S. Geological Survey Division in the Department of Interior.

Dwain Winters, who is Chairman of the Interagency Policy Committee for the National Acid Precipitation Assessment Program and Acting Director of the Office of Program Development of the Air and Radiation Program at EPA.

And on my immediate right, Dr. Courtney Riordan, who is Director of the Acid Deposition, Environmental Monitoring, and Quality Assurance Office in the Research and Development Program of EPA.

We do appreciate the opportunity to be with you today and, as you can see, I have brought with me the chief scientists from each of the agencies that have primary responsibility for acid rain research within the administration. Mr. Chairman, I commend you and the committee for holding this hearing. I agree with the members that it's very appropriate that we have this hearing and that we discuss the status of research, we discuss the information and the facts that are available to us and the facts that we are seeking through this research program, and attempt to respond to questions that you may have related to that research program.

What I would like to do, if it meets with your permission, is to submit my written statement for the record and try to summarize that statement from an outline.

Senator STAFFORD. That would be very agreeable to me and, I believe, my colleagues. Without objection, we will make your statement a part of the record.

Mr. THOMAS. Mr. Chairman, as you know, and as has been stated, acid rain is a problem. It's an environmental problem in this country and it's a problem that we feel we are dealing with. It is not a problem, however, that is without tremendous uncertainty, and the uncertainty from my view is probably greater than any of the uncertainties I deal with in decisions I make related to environmental risk. As has been stated by the Senator from Maine, I deal with those uncertainties in every issue I deal with, and I don't deal with any issue where there is no uncertainty.

The reduction of that uncertainty so we can have some basic decision rationale is the purpose for our research program as it relates to acid rain. It's a complex issue. It's an issue that has probably consumed more of my time as Administrator of EPA during the past year than any other policy issue within that agency.

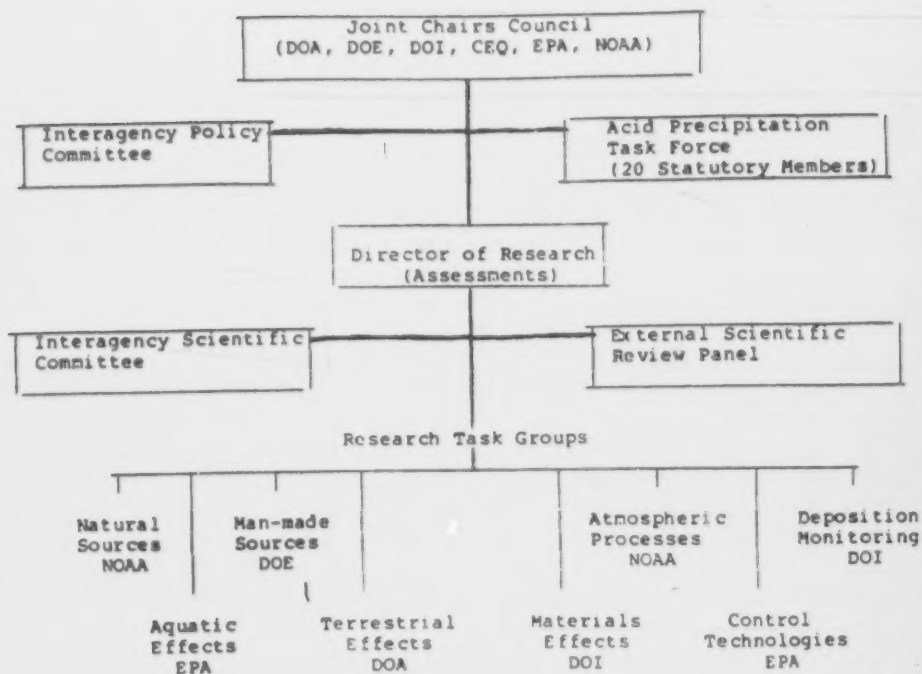
It is an issue, as well. As you know several years ago the administration addressed, and as stated several years ago, the administration's program relating to that issue included several factors. One, the administration felt we needed to move forward with an accelerated research program, and it's that research program that I would like to speak to today. But in addition to that we also moved forward with an accelerated policy analysis effort that re-

lates directly to that research program, and I'll speak to those issues.

We also moved forward using additional appropriations added by Congress, with a Federal-State program which really looks at what additional controls would be necessary and how those controls could be put in place in the States, if a determination was made that additional reductions were necessary over and above those that are currently being implemented under the Clean Air Act. An important element of the overall program is that we are moving forward with controls under the Clean Air Act as we have for the last 15 years and, as you know, they have accomplished significant impact significant impact on the possible precursors to acid deposition, specifically sulfur dioxide, nitrogen oxides, and oxone. Looking at implementing that Clean Air Act, that has got to be and always be the foundation for our emphasis on moving forward and looking at the additional uncertainties associated with acid deposition.

Let's turn, then, to the Acid Precipitation Act that Congress passed in 1980, that we moved forward to implement in 1981, that was first reflected in our budget for 1982. As you can see from the chart on my left, the National Acid Precipitation Assessment Program or NAPAP was established, and submitted to Congress as the organizational structure for this coordinated interagency research effort in fiscal year 1982.

National Acid Precipitation Assessment Program
(NAPAP)



Mr. THOMAS. A memorandum of understanding was signed between the principal agencies that are responsible for implementing and managing this coordinated research effort: the Department of Agriculture, the Department of Energy, the Department of Interior, the Council on Environmental Quality, the Environmental Protection Agency, and the National Oceanic and Atmospheric Administration. This is the Joint Chairs Council, and I chair that Joint Chairs Council.

We recently reviewed and reestablished the memorandum of understanding which lays out how we function. We basically are the policy group that oversee, make decisions, approve budget requests for this coordinated research effort. As you can see, we have an interagency policy committee and the Acid Precipitation Task Force which was specified by Congress, the 20 statutory members that Congress specified to provide advice to this Joint Chairs Council on the direction of the overall coordinated research effort. The Director of Research, as I introduced Dr. Kulp, who only joined us about 2 months ago as the new Director of Research, is responsible for the day-to-day management of this overall coordinated research effort. That includes the planning as well as the execution of a coordinated research strategy.

We have an Interagency Scientific Committee. Many of the principal members are with me today. We also have an external Scientific Review Panel, and I would emphasize the scientific review, peer review, that is required throughout this process. We are pushing very hard, the research community and the scientific community, in this effort. It's extremely important, I think, for the quality as well as for the credibility of results, that we have peer review—peer review not only of the research plans before they're implemented but of the results once they come in. One of the things that you will hear today as we discuss the status of research is where that research plan or where those research results are in, in a peer review process, before those results are published.

The funding for the National Acid Precipitation Assessment Program, as indicated, began in fiscal year 1982 at about \$17 million. In 1983 it was \$22 million; 1984 it was \$35 million; substantially increased with our request in 1984 and your appropriation of \$65 million. Our request this year of \$85 million is currently under consideration by Congress, in that request is incorporated in a number of different agencies' budgets.

But let's turn specifically, then, to what those funds have supported. They have clearly supported, over the last several years, the direction that I indicated in the administration's policy of an accelerated research program dealing with the uncertainties associated with acid deposition, for identifying the principal scientific uncertainties hindering policy development and targeting research to reduce those uncertainties have been two of our major goals over the last 2 years.

Let me caution, however, that looking for short-term answers and defining long-term trends and processes is difficult and dangerous. It is probably at the heart of why our scientist and our peer review process is as intensive as it is, to ensure that the answers we come up with on the short term will bear out over the long term as we look at trends and processes.

Now if I could have that second chart, let me just note what the principal uncertainties there are. I have found that there are a number of them. The answers are not as clear-cut as many would have us believe. Three primary areas: aquatic effects, forest effects, and atmospheric processes.

Under aquatic effects, what is the current extent of damage to surface waters? Under aquatic effects, we know that acid precipitation can impact on surface waters in this country. What we don't know is, what is the current extent of damage to surface waters? We don't know what is the prognosis for future damage at the current level of deposition. We don't have answers to what is the dose response rate. We don't have answers to what are target loadings relating to deposition.

What effect would changes in deposition rate have on the chemical status of surface waters? We do know there is substantial difference in watersheds. We do know there is a tremendous difference in buffering capacity as it relates to acidity in water.

We also have major uncertainties associated with the relationship between changes in this chemical status and biological effects in water. Clearly the biological effects are what we're looking for. What is the impact of acidification in the water? Establishing that relationship then becomes critical.

In forest effects, clearly we have far less information, far more uncertainty associated with forest effects than we do aquatic effects. What is the extent of the unexplained forest change in the United States? A basic question: What is the extent of unexplained change? From that, to what extent does acid deposition contribute to this damage? Very basic questions without answers today. What is the prognosis for future damage to forest resources?

Then relate it to the third major area of atmospheric sciences. What are the current patterns of emissions and deposition, not just wet deposition but, as indicated, dry deposition in this country?—a basic question, a basic question that needs answers in this regard.

How would deposition patterns change with changes in emission patterns? We're talking about long-term, long-range emissions. We're talking about long-range effects. Included in that is atmospheric and chemical transformations, major uncertainties and questions associated with deposition patterns and with emissions patterns associated with and related to that.

UNCERTAINTIES

AQUATICS EFFECTS

- * What is the current extent of damage to surface waters?
- * What is the prognosis for future damage at current level of deposition?
- * What effect would changes in deposition rate have on the chemical status of surface waters?
- * What is the relation between changes in chemical status and biological change?

FORESTS EFFECTS

- * What is the extent of unexplained forest change?
- * To what extent does acid deposition contribute to this damage?
- * What is the prognosis for future damage to forest resources?

ATMOSPHERIC SCIENCES

- * What are the current patterns of emissions and deposition?
- * How would deposition patterns change with changes in emissions patterns?

Mr. THOMAS. Now let's look at NAPAP, then, and where is NAPAP in trying to respond to these uncertainties?

First turning to aquatics, what I have done is indicated basic projects, project areas in each of these categories. I have identified when we expect results in each of these categories.

First, our national survey related to surface waters: As you can see, both eastern and western lakes in phase 1 are being surveyed. The eastern lakes survey was completed last year. The western lakes survey, the actual sample portion of the western lakes survey, was completed only in the last several weeks.

This relates to the uncertainty associated with, "What is the extent of damage?" It will give us a snapshot both of lakes and streams as far as their chemical status is concerned; the number of lakes and streams which are acidified; as well as the acid-neutralizing capacity of those lakes and streams. And it will relate to a national issue, both the east and the west.

A second portion of this will look at the variation over seasons of a subset of these lakes and streams. As this changes over season, what is the effect on lakes and streams? And we are using a subset of this snapshot, the snapshot establishing the baseline. Then, within that, a basis for long-term monitoring of trends as far as change in acidification of these lakes and streams.

Second, relating to the prognosis for the future, what will be the impacts? Our direct delayed response research associated with over 400 watersheds is a major part of that research effort. Is there a point at which the buffering capacity has been overwhelmed? Is there a point to which we are reaching, where acidification will move forward, or are we reaching a chemical equilibrium state at many of the lakes and streams in this country?

And, finally, through the Manipulated Watershed Program we are looking at the relationships between chemical and biological processes, where we are actually manipulating watersheds, looking at dose response, target loadings, and the biological response to those manipulations.

NAPAP RESEARCH

AQUATICS	PLANNING INITIATED	EXPECTED RESULTS
Eastern Lake Survey Phase I Chemical Status (extent)	FY-84	FY-86
Western Lake Survey Phase I Chemical Status (extent)	FY-85	FY-86
Eastern Stream Survey Phase I Chemical Status (extent)	FY 85	FY 87
Eastern Lake Survey Phase II Chemical Variability Biological Status Episodic Response (extent, biological response)	FY 85	FY 86
Direct Delayed Response NE Projection of Future Chemical Status Target Loading Simulations (prognoses, target loading)	FY 84	FY 87
Watershed Manipulations Projection Verification Target Loading Verifications Episodic Response Biological Response (prognoses, target loading, biological response)	FY 85	FY 88- 89- 90- 91- 92-
Direct Delayed Response SE (prognoses, target loading)	FY 86	FY 89
National Surface Water Survey Phase III long-term monitoring (prognoses, target loading, biological response)	FY 85	FY 89 continuing

Mr. THOMAS. Turning quickly then to forests and the forest program, you will see that here we are moving forward again on the two fronts where I noted uncertainties. One is, what is the occurrence of symptoms in this country? And what are the answers to the various hypotheses that have been put forward that relate to those symptoms?

First on the extent, the national survey of vegetation, looking extensively across the United States at where do we have symptoms? Those symptoms that we're looking for are those that are not unanswered by known factors such as drought, such as natural occurrences—in other words, unknown changes in forests. What are the symptoms nationally that may be attributable to acid deposition or some other unknown factor?

Second, an intensive study of selected forests in many areas, in many locations, that tests the various major hypotheses associated with forest damage as it relates to acid precipitation.

NAPAP RESEARCH

FORESTS	INITIATED PLANNING	EXPECTED RESULTS
National Vegetation Survey (extent)	FY 85	FY-89
Spruce-fir Research Cooperative	FY 85	FY 87-
Total Exposure Characterization		88-
Definition of Dominant Mechanisms (cause)		89-
Forest Growth Modeling		
Dose Response (prognosis)		
Southern Commercial Forest Cooperative	FY 85	FY 87-
Total Exposure Characterization		88-
Definition of Dominant Mechanisms (cause)		89-
Forest Growth Modeling		
Dose Response (prognosis)		
Eastern Mixed Hardwoods Cooperative	FY 86	FY 88-
Total Exposure Characterization		89-
Definition of Dominant Mechanisms (cause)		90-
Forest Growth Modeling		
Dose Response (prognosis)		
Western Forest Cooperative	FY 86	FY 88-
Total Exposure Characterization		89-
Definition of Dominant Mechanisms (cause)		90-
Forest Growth Modeling		
Dose Response (prognosis)		

Mr. THOMAS. Our third major area of uncertainties and therefore our research program, atmospheric sciences: First, establishing that basic baseline of information on emissions and deposition. We have established and deployed and are receiving information from our wet deposition network, a nationwide network, a monitoring program. We are deploying our dry deposition network across the country to establish the same baseline of information. Additionally, we are deploying our cloud monitoring network which will look specifically at the unique environment above the cloud base which may, in fact, be impacted by the clouds themselves.

NAPAP RESEARCH

ATMOSPHERIC PROCESSES	PLANNING INITIATED	EXPECTED RESULTS
National Trends Network -wet dep- (deposition)	FY 82	FY 84
Dry Deposition Network (deposition)	FY 85	FY 87
Regional Acid Deposition Model I (RADM) (source receptor)	FY 84	FY 86
Regional Acid Deposition Model (RADM II) (source receptor)	FY 85	FY 88
Engineering Model (source receptor)	FY 84	FY 87
Mesoscale Model (source receptor)	FY 84	FY 87
International Sulfur Deposition Model evaluation (source receptor)	FY 82	FY 87
Model Evaluation Design Plan (deposition, source receptor)	FY 85	FY 87

Mr. THOMAS. So three major networks have been deployed or are being deployed for this baseline information—our wet deposition network, our dry deposition network, and our mountain cloud network. The mountain cloud network as well will provide basic information which is incorporated in the need to know related to atmospheric transformation and atmospheric processes. A major part, then, of the work that's going on in addition to this network relates to the development of far more sophisticated models to give us information of not only what occurs with long-range transportation of pollutants, as far as atmospheric processes and chemical reactions, but also far more specificity as to where those effects would occur when we look at specific locations for emissions.

So, in conclusion, Mr. Chairman and members of the committee, I would emphasize that the accelerated research program which is being managed under the NAPAP process is critical to our—both the administration, your, the American people's—need to know the answers to this critical problem of acid deposition, to reduce the uncertainties, which are many in this particular area, and to come to a conclusion as to whether additional controls under the Clean Air Act are needed or are not needed and what, in fact, the impact of those controls will be as far as deposition is concerned.

I appreciate the opportunity, again, to be with you and members of the committee to speak to this research program and the specific issues associated with it. My colleagues and I will be pleased to respond to your questions.

Senator STAFFORD. Thank you very much, Mr. Thomas.

Might I suggest to my colleagues that in going to questions we, for the first round at least, limit ourselves to 10 minutes per member and see where we're at and if a second round is necessary? Would that be agreeable, so that everybody at least will get one 10-minute shot before events on the floor catch up with us? If that's agreeable, then, we'll do it that way.

Mr. Thomas, let me ask you this question: The 1984 NAPAP annual report states that between 1980 and 1983 overall sulfur dioxide emissions declined by 10 percent. The press release accompanying the report highlighted the fact that SO_2 emissions peaked in 1973 and were followed by a steady decline. It's our understanding that estimates of emissions for 1984 have been completed. Could you advise the committee what these estimates indicate? That is, has there been an increase of SO_2 and oxides of nitrogen in 1984, and if so, how much?

Mr. THOMAS. Mr. Chairman, let me ask Dwain Winters if he would respond to that.

Senator STAFFORD. Certainly.

Mr. THOMAS. Dwain.

Mr. WINTERS. Mr. Chairman, it's my understanding that the full data for 1984 has not gone through the full review, but the data for the first portion of the year indicate an increase in emissions.

Senator STAFFORD. An increase in emissions?

Mr. WINTERS. An increase in emissions. We are waiting to have the full data base for the full year, to know whether in fact for the full year we have an increase in emissions. This would be consistent with the fact that the decrease in emissions had been leveling out when we look at the time before 1984. In that reduction you see

from 1973 to 1983, the major reductions occur in the early part of that period.

Senator STAFFORD. How much of an increase could you project for the whole year based on what you know for part of 1984?

Mr. WINTERS. We do not have a basis to make that projection yet because there are several processes one goes through, in going from preliminary numbers, to refine them to full numbers. That's why we prefer to wait until we have the full data base and understand exactly what they do, because you can have seasonal trends which aren't indicative of the annual trend.

Senator STAFFORD. How soon do you expect you will have the rest of the information for 1984 so you can make a projection?

Mr. WINTERS. That's not done by our office, so I don't know the answer, but we can provide that for you.

Senator STAFFORD. I see.

Now I have what really amounts to an essay, I guess, and it may end up with a question. This was not written by a Vermonter.

During the course of preparing for this hearing, the committee began collecting information on a variety of subjects, one of which was the impact of acid deposition and air pollution generally on North American forests. This is a matter of special concern because the forests of Europe are suffering massive damage which the officials of Germany, Switzerland, and Austria are convinced is caused by acid rain and air pollution.

There has been visible forest damage in the United States, as well. Most notably, some of it is at Camel's Hump in Vermont and Mount Mitchell in North Carolina. I think, Mr. Thomas, you know this because you have personally visited Camel's Hump.

When the committee first asked whether there were observed forest declines in the United States, the statement was made that growth declines of 5 to 10 percent had been observed in the Southeast—I repeat, Southeast—United States, but in reviewing the written information provided to the committee, we found a document captioned, "Softwood Growth Trends in the Southeast: Status Report." Allow me to quote from this report.

Areas of timberland in the Southeast peaked at 91 million acres in 1963 and since then has declined to 85 million acres. The in-growth volume of yellow pine saplings has declined since the early 1970's. The softwood in-growth is now reflected not only in reductions in in-growth volume but also in reductions in the volume in the 6 to 10 inch diameter classes of the inventory. During the past decade, annual mortality of all live yellow pine timber in the region has almost doubled.

The paper goes on to state that a further analysis was conducted of yellow pine growth in the Piedmont regions of the Southeast. This analysis revealed that—and here again I am quoting:

The average diameter growth of yellow pines had declined by a total of 40 to 50 percent since the period 1957 to 1965.

Parenthetically, I will say that I can see I am going to use my 10 minutes up launching this query.

Senator MOYNIHAN. Mr. Chairman, you take your time.

Senator STAFFORD. The committee requested copies of the full report, but none was provided. However, an outside organization, the Society of American Foresters, supplied the committee with other reports, also stating that there has been an apparent sub-

stantial decline in softwood growth in the Southeastern United States.

Now allow me to turn to a different subject, but the same issue. The subject I would like to discuss now is the damage done to materials by acetic deposition, which is another matter on which the committee has begun to collect information. In the conduct of the acid deposition assessment program, the agency has conducted studies of the effects of acid on building materials, such as paint, stone, and metal. The analysis of these data suggest, anyway, that acid deposition accounts for \$5 billion a year in materials damage. Apparently there are some uncertainties associated with this study, such as whether a metal substrate should have been used rather than a wood substrate. Because of these uncertainties, the report is not being made available to the public.

The issue joining both of these two subjects is where and how often information should be withheld from the public in the name of uncertainty. I would be the first to agree that the apparent forest damage might not have occurred at all, much less be due to air pollution or acid rain. I would also be the first to agree that it is legitimate to criticize the study on valid technical grounds such as the nature of the substrate.

But some information is intrinsically so important that it ought to be released even when there may be some uncertainty. In my judgment—and of course you may disagree—an apparently doubling in mortality and a 40- or 50-percent decline in growth of the most important commercial timber in the Eastern United States is of extraordinary importance. Whether caused by air pollution or pestilence, it is important to the American economy and the American environment. Indeed, even if the death rates and growth decreases are only apparent and not real, it's still vitally important information.

I suppose, as I indicated at the outset, that this is a statement, not a question, but I would appreciate, Mr. Thomas, your comments or those of your colleagues if you care to offer them.

Mr. THOMAS. Mr. Chairman, let me see if we can't respond to three parts of your statement.

Senator STAFFORD. All right.

Mr. THOMAS. The first relates to the information that you noted relating to forest effects in the Southeast. The second relates to the status of materials effects research, and the third relates to the process we use for releasing information under the NAPAP program.

To deal with the first set of points you made concerning forest effects and impact in the Southeast, I am going to ask Dr. Shea from the Department of Agriculture if he would respond to that study.

Senator STAFFORD. Dr. Shea.

Dr. SHEA. Thank you.

You mentioned the Federal Republic of Germany, and even there I think there is still a great deal of scientific uncertainty in those cause and effect relationships.

As we come to the Southeast, one of your comments related to the decline in total area of the southern pine resource. I might say, Mr. Chairman, there are a number of factors that relate to that:

the reversion of forest lands back to their former agricultural production, and so forth.

Now when we talk about the growth question, your information is correct. There has been a definite reduction in the diameter increment and basal area of southern yellow pines in the Southeast, both in the Piedmont and in the coastal plains. Those data have been—well, we have completed our overall peer review, so I feel confident in the quality of the data. We are in the process of releasing the publication and we would be pleased, of course, to provide this committee with copies of the publication.

Senator STAFFORD. Thank you. We would be gratified to get it.

Dr. SHEA. Now you also mentioned the question of mortality, and there are a wide variety of causes, of course, of mortality, and especially in the South where I think many of the committee members are aware of the Southern pine beetle and the extensive damage it is causing across the Southern portion of the country.

Now coming back to the question of the perceived growth reduction in the Piedmont and in the coastal plains, at this point in time there can be any number or a variety of causes and effects. Some of this can be the fact that the forests were planted on old fields which may have had a high level of nutrition, and now that is disappearing. There have been a number of climatic extremes—cold, drought, et cetera.

Likewise, of course, there is always a possibility that acid deposition could be a factor in this. At the present time there is no evidence that acid deposition either is or is not a factor. This is one of the things that we in the Forest Service with our colleagues in EPA have entered into a major program, looking at the Southern pine resource and attempting to answer these very questions.

I'm not sure I answered all your questions, sir, but if you have some others I would be pleased to respond.

Mr. THOMAS. Mr. Chairman.

Senator STAFFORD. Mr. Thomas.

Mr. THOMAS. I feel that's a fairly general response with specifics to the points you made on the report, and it may be if we turn now to the materials issue you raised, I would ask Dr. Courtney Riordan if he would respond to that issue.

Dr. RIORDAN. Yes. Mr. Chairman, from its inception the NAPAP program has recognized that acid deposition has the potential of causing damage to materials, and we have had research ongoing since 1982 in that area.

But addressing specifically your concerns about the \$5 billion estimate that appeared, I believe, in The New York Times, that is associated with someone's interpretation of a draft report that was being prepared as part of the 1985 assessment, which is now scheduled for release about April 1986. It is draft material that at the present time is undergoing review by some 2 dozen scientists. We do, in fact, try to withhold these draft materials, not for the purpose of political ends but rather for the purpose of making sure that the reports that we ultimately release to the public are scientifically defensible and accurate.

I might add, just as a parenthesis, that in the report itself there is no \$5 billion figure. It is a draft report which contains a range of numbers. We have had one peer review of the damage functions

that contributed to that report, and the whole report itself is undergoing review, and I think it would be appropriate for us to wait until we get the results of that review before coming to conclusions about its content.

Mr. THOMAS. Mr. Chairman, that probably is as good an example as I could give related to your last point, and that has to do with release of information. I can assure you that there is no intent, nor has there been any action on the part of our agency or others under NAPAP to try to withhold, for scurrilous reasons, information from the public as it relates to this research. But we do have a responsibility, I think, as I said, to ensure that the quality of the data and the quality of the analysis not only has been reviewed by our scientists but has gone through the peer review process, which I think is critical before that data is released.

Now one of the things I found when I came to EPA 3 years ago is that there is generally an early release of information. It can be very early or it can be close to the time when this kind of review process has been completed. As Dr. Riordan indicated, the release of the information associated with materials damage was fairly early. There was a draft that was in the process of undergoing the kind of review which I think is necessary and my colleagues think is necessary before a final report is put together.

So we have a process that we try to ensure the scientific integrity of the information before it is released, but we recognize that oftentimes, both in the press and otherwise, the public is going to see early drafts of information, so we have a process of trying to respond by noting it's an early draft, by noting it's undergoing a review process, and also oftentimes trying to respond to the preliminary results of that early draft.

I would say also, Mr. Chairman, it's an issue oftentimes with Congress. I would say that we bend over backwards to try to make available to Congress the information that Congress wants. Oftentimes that is very early drafts of information, and we try to caveat it heavily with where in the process that information is.

I think that's a general review to the issue of release of information, as well.

Senator STAFFORD. All right. Thank you very much, Mr. Thomas. I see I have run over my limit a bit.

Senator HART.

Senator HART. Thank you, Mr. Chairman.

Mr. Thomas, we are going to vote later today on a small disaster called Gramm-Rudman. Have you done any calculations as to what that legislation will do to this program?

Senator STAFFORD. I was going to say it has given the chairman acid stomach.

Senator HART. Yes; not just the chairman.

Mr. THOMAS. I have not, Senator.

Senator HART. You might inform the committee, if you could do some calculations. I don't think they have to be precise, but just generally.

One of the witnesses at our Colorado hearing made this statement:

Those who would wait until all scientific questions are answered, would have us wait until all the scientific questions are moot.

Do you have any response to that, generally?

Mr. THOMAS. I agree with it.

Senator HART. And it's not your intention to wait until all the scientific questions are answered?

Mr. THOMAS. No, sir.

Senator HART. Mr. Thomas, because of the extreme vulnerability of western lakes and the peculiar ecology of that area, some environmentalists fear that acidification, once it has begun, could severely damage many of these lakes at once. We would not get any kind of warning shot. It would just be kind of a fatal, almost instantaneous salvo. Do you or any of your colleagues have any response to that?

Mr. THOMAS. Senator, let me ask Dr. Courtney Riordan to comment specifically on that.

I would say that overall, as you know and as came out in that hearing, one of the issues in the West, particularly in the high mountain areas, has to do with the limited acid neutralizing capacity of those high mountain lakes. That is why as a part of our western lakes survey we were very interested and did pursue sampling of those high mountain lakes, many of them in wilderness areas, both to determine the acidification of those lakes as well as to look at the acid-neutralizing capacity of those lakes.

Courtney.

Dr. RIORDAN. Yes; Senator, the issue of timing and the impact of acid deposition on surface waters has been a concern to the NAPAP program for quite a while, in the East as well as the West. I can say that, simply on the basis of what we know now in terms of the stages of acidification that the science says occur as a lake water becomes acidified, give us reasonable confidence that we're not dealing with something that is going to happen to many lakes immediately, at one point in time.

That has to do with the fact that you do have a population of lakes out there, varying from extremely sensitive to less sensitive lakes, and we expect as a result of our monitoring activities and our research going on, that were we to begin to see lakes fall off that sensitive end, that we would have sufficient warning so that we would be able to bring that to the attention of the policymakers.

Mr. THOMAS. Dr. Kulp might want to add to that.

Dr. KULP. I think particularly in the Northeast, for example, the total amount of sulfate precipitation has been within about 20 percent for almost 50 years. It is not rapidly growing, and this would suggest that many of the lakes are at equilibrium or, if they are changing, they will change slowly or only a few at a time. So I think the probability of a catastrophic event is really scientifically quite unlikely. That does not mean in the very long term there would not be change.

Senator HART. Well, finally, that brings me to one further question, and that is what this project is doing in terms of incorporating data produced by individuals and outside organizations? One of our witnesses, Professor John Hart—no relation—who is a professor of energy and resources at Lawrence Berkley Lab at the University of California, and also a researcher with Rocky Mountain Biological Lab in Colorado, has turned up data that shows that

some fish—trout, particularly, and other aquatic life—in lakes in Colorado are failing to reproduce because of increasing acidity. Are any of you aware of that data and, if so, what cognizance have you taken of it?

Mr. THOMAS. Let me say overall, Senator, a major part of the NAPAP program is not just the pursuit of a coordinated research strategy within the administration and within these agencies, but also the incorporation of both joint research as well as findings from research that is conducted, not just in this country but internationally. And as a part of the program that I outlined, there is extensive international cooperation, particularly with Canada and with other countries as well. This specific research within the United States, I am not aware of it? Are you aware of it, Courtney or Larry?

Dr. RIORDAN. It was just brought to my attention that we are aware of that particular study and it is being factored into the 1985 assessment review that is going on at the present time, but Larry can probably confirm that.

Senator HART. "Factored in" means what?

Dr. KULP. Carefully reviewed and given proper scientific weight.

Senator HART. Thank you very much, Mr. Chairman. I've got to go help lead the Light Brigade into the valley of death.

Senator STAFFORD. Thank you, Senator Hart.

Senator Moynihan.

Senator MOYNIHAN. I've got three general questions, Mr. Chairman. The first is for Mr. Thomas.

As you know, in 1983 the EPA was put under a court order to respond to section 123 of the Clean Air Act having regard to the height of smokestacks. We found that in order to meet the local air quality standards, that all around the country people were just putting up great big, tall stacks, and that was putting lots of pollutants up into the atmosphere and the winds were taking it across the country and hitting the Adirondacks, for example. If the numbers come to my head correctly, in 1970 there were about six stacks in the country that were 500 feet tall or more, and by 1983 or 1984 there were now about 200. This was just clearly designed to avoid the Clean Air Act.

Your predecessor, Mr. Ruckelshaus, told me that it was very clear that the President could sign an executive order that you could draft, that would have cut sulfur dioxide emissions by 6 million tons simply by specifying the heights of stacks. Instead, you signed one that did the absolute minimum, 1.6 million. Now we have been talking of a 10 million reduction. You had a chance to do it, you had a chance to cut 6 million with the stroke of a pen. We urged you, we urged the President. It was the President's decision, I suppose.

You didn't do it. Why? What was your reasoning for not doing it? This committee has passed legislation repeatedly that would urge you to do it. The Congress hasn't, but this committee has.

Mr. THOMAS. The short answer is, I didn't have the legal authority. The tall stacks regulation I think is probably as good an example as I have seen in quite a while of the process of legislation, regulation, and litigation. That issue—as you know, Senator, better

than I—has been an issue that has been dealt with both in a regulatory sense, in a legislative sense, and through the courts.

When I got the regulation and dealt with that regulation, I dealt within the confines of the law as you passed it and the law as it was interpreted by the courts. What I did was exercise my discretion within a fairly narrow band, based on the statutory and judicially imposed constraints that I was given in that regulation. I think the 1.7 million ton reduction associated with the tall stacks regulation, as you stated, our projection, was the reflection of the constraints that I operated within.

Senator MOYNIHAN. Let me say that that 1.7 million is welcome, but I don't think we have heard this from you before. I know that Mr. Ruckelshaus felt he could have gone to the full 6 million. Could we get a memorandum of law from you?

Mr. THOMAS. Oh, sure.

Senator MOYNIHAN. Because it may be that we make the laws up here.

Mr. THOMAS. The issue has been briefed a number of times. It has been argued a number of times and will be argued a number of times in the future, as far as the courts are concerned.

Senator MOYNIHAN. Well, maybe, Mr. Chairman, this may be something that we just might well clarify, because if the Administrator felt he couldn't do something obviously this committee wanted done, would have wished, liked to see done, because he was constrained by statute or by judicial decisions, litigation, why maybe we should attend to that.

Mr. THOMAS. But, Senator, what I did say also was that I did what Congress said they wanted done, as the courts interpreted it.

Senator MOYNIHAN. Well, why don't we get a statement from you, and then maybe we'll say something different.

Mr. THOMAS. All right.

Senator MOYNIHAN. Now can I just go on to ask you, sir, and all these gentlemen, and Dr. Kulp in particular—Dr. Kulp, we welcome you to the directorship of this program which matters a great deal to this committee—how is cooperation with Canada going? We feel very seriously that this is a matter of concern to the United States, of concern to the President. The President, when he met with Prime Minister Mulroney in Quebec on March 17 of last year they issued a statement that something had to be done jointly, and each of them has appointed a principal to negotiate and reach some joint agreement. How is that coming, and are you involved? Are you being asked to help out? Drew Lewis has called on many of us; he has called on me. He is a very capable man. He has got to get something done. The President of the United States has entered an international understanding with our most important neighboring country that we are going to do something. Now what are we going to do?

Mr. THOMAS. Senator, as you indicated, that process did begin last year, and the President and the Prime Minister asked the two envoys if they would report to them at their next meeting, which I believe would probably be over in the spring, basically a year from last year. I am fully anticipating a report from those two envoys to the Prime Minister and the President before that meeting.

Now there are two parts of cooperation with Canada I can speak to. That's an obvious one, the cooperative effort that the President and the Prime Minister indicated that they wanted these special envoys to undertake. As you indicated, our envoy, Drew Lewis, has had extensive discussions with any number of parties within the United States, including us, including extensive briefings and discussions with us related to this research program as well as policy analysis on acid rain, and that will come to conclusion with his report.

The other part, and the part that has been an ongoing effort with Canada for quite some time, is the research program, the sharing of information, the joint research projects, carrying out the memorandum of intent that was established on a joint research program. Dr. Kulp, I think, probably can elaborate on that with some specifics as far as now.

Senator MOYNIHAN. May I just ask Dr. Kulp, is that work going well? I mean the collaboration part.

Dr. KULP. Yes; I would say very well. We have been meeting with them a minimum of two times a year. In fact, we are going up on Friday for a full day session of their technical/scientific group that is comparable to the NAPAP scientific group. We take our experts and they sit down with their experts.

Senator MOYNIHAN. Yes.

Dr. KULP. Several cooperative programs have come out of that: The comparison of our protocols on lakes; the comparison of our protocols for wet deposition measurements, so that we are measuring the same thing on both sides of the border. Their results, then, can be looked at as we draw contours of these things. We are also working with them toward an evaluation of these complex meteorological models to try to verify the model from source to receptor.

Senator MOYNIHAN. Would you say that the state of their science is about the state of our science at this point?

Dr. KULP. In a general way, they are very competent scientists.

Senator MOYNIHAN. Sure, and they don't feel they have reached a conclusion which you are still reluctant to reach.

Dr. KULP. No; I would say among the scientists there is a fair agreement.

Senator MOYNIHAN. That's is what I would expect.

Can I just say, then, Mr. Thomas, I don't think President Reagan and Prime Minister Mulroney met in Quebec to say, "Let's have a year's discussion and then give us a report that says we need another year's discussion." They decided to do something. Now are you giving them any recommendation about what to do?

Mr. THOMAS. Senator, we have had extensive discussions with our envoy related to his charter. He is the one who is going to make recommendations, given his independent charter by the President, and particularly with the foreign policy view that he was given. I have made any number of findings and recommendations in discussions with him on this issue.

Senator MOYNIHAN. All right, sir. I don't want to use up my colleagues' time, but let me just say, we have the prospect here of a radical disjunction between two heads of Government who said we are going to do something and a scientific community lagging behind, saying, "We can't tell you what to do," whereupon they'll

say, "Well, we will do this anyway," and the next thing we will hear, "Well, this wasn't scientifically based."

It seems to me you've got to organize yourselves. Drew Lewis is not going to just make up a proposal, you've got to help him. There is a decision being made by our Government.

Mr. THOMAS. And we have done everything we could to try to provide him as much information as we've got related to that, Senator.

Senator MOYNIHAN. As the French Canadians would say, "Un favior."

Senator STAFFORD. Thank you, Senator Moynihan, and you did finish precisely on time.

Senator Lautenberg.

Senator LAUTENBERG. I can't promise the same results, Mr. Chairman, but I'll try.

Senator STAFFORD. I'll advise you of that.

Senator LAUTENBERG. Thank you.

Lee, it's always fascinating to listen to your very persuasive and logical explanations of problems and how we solve them. It might assure some of us that all things are in order, but I know you and your colleagues must share the frustration of seeing the damage from acidification taking place in our country, and the remedial pace is one that is slow and terribly frustrating.

I listened very carefully to what you had to say, as I always do, and I didn't hear any statements about health or materials, and I would like to ask you first if you agree with the statement made by the OTA that says that:

Total pollutant emissions in the United States and Canada have been estimated to result in about 50,000 premature deaths a year, increasing the mortality rate in 1978 by about 2 percent.

Is that something that any of you want to challenge?

Mr. THOMAS. I'm sorry. I'm not familiar with that specific figure. I don't know, Dwain, whether you want to deal with it or not, but I would make one overall point, Senator. There is a tremendous difference between dealing with the issue of air pollution and dealing with the issue of acid deposition, and that's where you deal directly with the issue of direct health effects.

We in EPA, as you know, are charged under the Clean Air Act with dealing with direct health effects as they relate to air pollution, by establishing standards and by implementing those with the States, and we do that on a continuing basis—sulfur dioxide, oxone, lead. You are aware of the things we have done. So as it relates to air pollution, that is one issue, but there is a far reach between the issue of air pollution and then the issues of acid deposition.

Senator LAUTENBERG. Right. Do you want to comment, Mr. Winters?

Mr. WINTERS. I will try. It's not an area that I am a full expert. As I remember the OTA report and the numbers you are citing, that comes from estimates of health effects to a great extent due to sulfates in the atmosphere.

Senator LAUTENBERG. Right.

Mr. WINTERS. That estimate is based upon one particular collection of research. There is a lot of other research in that area, and

this area is one of the most controversial areas in air pollution right now, as to whether those effects are present or not. There is new research that has come out since then.

Up until this point, EPA has not recognized those numbers as being scientifically defensible numbers in terms of total health effects from that from of air pollution. As you know, we go through a regular process of reviewing new scientific information and reviewing our ambient air quality standards to see whether or not the standards need to be revised on the basis of that information. I do know that the research upon which that particular calculation is based is part of the research that is involved in that ongoing review of health effects from airborne sulfur.

Senator LAUTENBERG. So what you are saying is that this material produced by the Brookhaven National Laboratory's Biomedical and Environmental Assessment Division, their OTA contractor report done in May 1982, you are saying that this is a controversial report, and in fact when you say "controversial" it suggests that this report might in fact be scientifically unqualified to be considered.

Mr. WINTERS. I would say that other scientists and analysts looking at the same data have reached different conclusions, and I think the running conclusion that we have reached so far doesn't warrant as large an estimate as you see there. I give you that, being an observer of the process more than a participant in it.

Senator LAUTENBERG. Let's for the moment talk about materials damage. Lee, did I, by the way, miss anything when I suggested that you omitted in your testimony and charts a discussion of health and materials damage?

Mr. THOMAS. In the presentations, no. When I was talking about aquatics effects, forests, and atmospherics, we did talk about it to a certain extent in response to Senator Stafford's question. I would note that, as we indicated, the materials effects have been a component of the acid rain research program since its inception, and if you look from 1982 on you will find that it has been an increasing budget item, going from about a half a million up to close to \$3 million a year related to materials effects damage, but Dr. Riordan could speak specifically to the components of that research program.

Senator LAUTENBERG. Before he responds, I want to let you know what I am working from, and that is the National Clean Air Coalition report. It says:

Materials Damage Assessment, a draft study by EPA, Brookhaven National Lab, Army Corps of Engineers, suggests that an acid rain control program might pay for itself in reduced damage. The study gave a preliminary midpoint estimate of \$3.5 billion for damage caused by acid rain to buildings, and estimated these damages could run as high as \$6 billion a year.

Is that within the realm of reasonable assumption, accuracy, whatever?

Dr. RIORDAN. Those are the figures in the draft report, I believe, Senator. There are issues relative to that report that have to be resolved through the peer review process that could markedly affect those numbers, and it has to do with the source of the damage data and the methods used to extrapolate from damage in the laboratory to damage on buildings, and then from individual buildings up

to an inventory. There are several steps that one has to go through in order to come up with those numbers, all of which have debatable aspects to them, and I couldn't predict at this point in time where the review is going to come out.

Senator LAUTENBERG. Again we get engaged in what I frankly think, without being disparaging at all, is some academic debate. Lee, I think I just heard you say that \$3 million was being spent in that area of research. Damage estimates could be as high as \$3.5 to \$6 billion, challenge it, if you will. We certainly see a disproportionate result in terms of letting it happen—and I know that is not your choice—as opposed to doing something that is more specific and more contemporaneous to deal with the problem.

I have a report here that details the costs to citizens of various States and cities around the country in terms of material damage. It is estimated that in the State of New Jersey alone there is a \$25 to \$30 per resident cost for damage in just eight cities, and this is a list of places. You may have seen this list of cities where the damage is very obvious. Unfortunately, included in things that may be damaged and even irreplaceable are monuments, statutes, buildings, et cetera. Even people could be permanently damaged if we don't get on with some remedial action here.

I wonder whether we are using the right approach to solving this problem. I hear each one of you learned gentlemen talk about the balance, and Lee at one point used the comment—either you or Dr. Kulp—on a state of equilibrium in some of these lakes and ponds. Does that mean totally dead and doesn't get any deader as the years go by? Is that what we're talking about? What is a "state of equilibrium?" A damaged facility, a damaged pond, a damaged body of water that doesn't support any marine life, that doesn't support vegetation? What is a "state of equilibrium?"

Dr. KULP. No; "equilibrium" can mean that it is going to stay at present levels of deposition, it is going to stay non-acid, has fish and will continue to have fish indefinitely. That's one category. Another category, which we might term a "granite bathtub" where there is no opportunity for neutralization in the soil, then the water in that particular body of water would have the acidity of the rain and so would be instantaneously at that level, and then you have intermediate ones that might be changing very slowly. But the point I was making was that in the Northeast the emissions and the precipitation have been fairly uniform—there have been some peaks and valleys—but fairly uniform for almost 50 years on the sulfur side, so that one would expect that whatever the status of a particular lake, it is essentially at equilibrium.

Senator LAUTENBERG. I think there are those on this side of the table who would say that we see things happening with our own eyes and with people that we know, see the continuing degradation of bodies of water, forests, et cetera, and whether the cause is precisely identifiable or not, it is believed by lots of people with the backgrounds to estimate these things that acidification is the principal cause of this. What I see happening is—and respectfully acknowledge—continuing research without any parallel action to try and stop this at the same time.

That's the way I see it, and I wonder whether we are taking the right course of action with the structure that we've got here. Not

to degrade it at all, but it is a forum for debate and discussion, and there are those of us who are looking for some action, that say, "For crying out loud, stop this stuff from penetrating our atmosphere, our lakes, our forests, perhaps our lives." We are very unhappy with the fact that we don't see a specific thing taking place that can make us assured that it won't be 30 or 50 years before we start to see some action.

Lee, is this the best? If you had your choice, would you have chosen this structure to deal with this problem?

Mr. THOMAS. Senator, I think the process that has been set up and the NAPAP structure is the kind of structure you need when you've got the kind of intergovernmental capacity that has to serve this issue. It is a complex issue. It cuts across any number of areas, and you need to bring together the total effect of your research capacity to deal with it, and that's what Congress told us to do. I think they were right, and I think we have tried to do that.

Now the frustration you have is the length of time it is taking us and the amount of uncertainty that we feel needs to be reduced before we recommend to you additional controls. I would tell you from my chair there is a lot of action underway, both as far as the research program as I have laid out, as well as far as the Clean Air Act is concerned. As the person who sat there and received tons of letters from Members of Congress about the tall stacks regulation that I issued, I can tell you that there was strong opinion on all sides of that, but the end result was I think we reduced sulfur dioxide by 1.7 million tons. As the person who issued the regulation on heavy duty trucks, I can tell you that that has an impact and a continuing impact in years to come on nitrogen oxides. As the person who is implementing the program related to ozone, I can tell you that we have an aggressive program on ozone.

So underneath, as a foundation of what we are doing, bear in mind we are continuing to implement the Clean Air Act while we are trying to reduce uncertainty through this research program to determine whether any additional controls are necessary or not. So from where I sit it's a hell of a lot of action, both on the research side and the implementation side. I realize it's frustrating for you when you want more action quicker. It's frustrating for me from all sides when I'm trying to balance that uncertainty with the decisions I have to make every day.

Senator LAUTENBERG. Thank you, Mr. Chairman.

Senator STAFFORD. Thank you, Senator Lautenberg.

Senator Mitchell.

Senator MITCHELL. Thank you, Mr. Chairman.

Mr. Thomas, you have today described in some detail research projects now underway and proposed. This is, of course, the 6th year of this program and many research projects have already been completed. My question to you is, as the Administrator of the Environmental Protection Agency, in your opinion when—what year, what month—will we, the American people, the U.S. Government, the EPA, when will we know enough to decide finally on a course of action to deal with the problem of acid rain?

Mr. THOMAS. Senator, as you indicated, that's the same question you asked me during confirmation and the one you asked Bill Ruckelshaus and people before that, and I've got to give you the

same answer. That is, I can't tell you when the answer is going to come to me from a research program to say, "OK, Thomas, you have reduced the uncertainty to the point that you can recommend no more controls are necessary," or that you can recommend, "We need additional controls, and we need them here, and we need them for these pollutants."

I can tell you, though, that as you look at this research program we've got underway and as you look at what it is aimed at as far as those uncertainties, over the next couple of years is when most of the findings are going to be coming out. If you look at the kind of expected result dates you look at in this program, we will have a heck of a lot more information in the next couple of years, both related to aquatics, both related to forests and atmospheric sciences, that I think will reduce a lot of the uncertainty that I pointed out when we first started this discussion. So I think that's the general timeframe within which you can expect me to say, "This is the information I've got. This is how it feels with the uncertainty, and no, Senator, I don't think we need additional controls," or "yes, Senator, I think we do, and I think these are the pollutants we need to deal with, and this is the way I think we ought to move forward with it."

Senator MITCHELL. Well, let me just say, Mr. Thomas, that I have great respect for you personally, I believe all of the members of this committee do. The problem with that answer is, it is identical to the answer which could have been given by each of your predecessors and is virtually identical to what they did in fact say. Every time an EPA Administrator has come up here, and you are the third one in the last 5 years, the statement is the same: "We've got a lot of research underway, and we should be getting this information in the next couple of years, and maybe then we'll know."

You see, obviously the administration has taken a political position on this issue, and the political position is that there will not be any controls on acid rain. The continued research is, of course, an implementation of a political policy. It would be less troubling, more easily acceptable if you or any of your predecessors would have said, "Well, here are the questions that are unanswered. Here are the research projects intended to answer them. This is when those projects will be completed and when we expect to have those answers, and then we'll make a decision on a policy on this."

But instead of that what we receive are general responses: "There are scientific uncertainties. There are research projects underway, and at some yet to be identified future date." Six years after we started the process, dozens, perhaps hundreds of research projects after we started the process, with evidence accumulating of actual and potential damage, the answer is essentially the same. That's what I find most troubling.

I would like to pursue a little bit that aspect of it and some of the responses to the chairman's question regarding the release of information and the peer review process. Now consider this framework: An administration that has a political policy of not wanting any action; research is underway. In the course of this inquiry we have learned that there are two reports, the "Eastern Lake Survey," and the second one was the report on softwood growth trends in the Southeast. You have emphasized the necessity for

peer review but indicated that from time to time such reports are made public prior to peer review.

In a general sense, what we know so far about the "Eastern Lakes Survey"—and all we know has come from the EPA, we have not seen the data, no one has seen the report outside those who are involved in it—is that it tends to support the political policy of the administration: a statement made in the memorandum to you by Mr. Goldstein that "We now believe that preliminary survey data support our earlier contention that the number of acidic lakes is small." It tends to support that. That report, therefore, or at least a memorandum purporting to summarize it, was released to the public with a press release and much fanfare in August 1985, even though by your own statements the scientific peer review process will not commence until January 1986.

Now take the other report, a report on softwood growth trends in the Southeast, with respect to which we don't know all the information. Dr. Shea has given some indication of it, but it tends to permit an opposite conclusion; that is, it tends to contradict the administration's political policy, indicating that there are some problems as a result of this. How is that handled? That report is not made public. There is no press release. The committee staff finds out about it and has to ask about it in order to get it, and of course Mr. Shea quite rightly makes cautious and guarded statements about it, and correctly so. That's the scientific basis.

These facts, if correct, would permit the inference to be drawn that the release of research data is based upon whether or not it tends to support or contradict the administration's political policy. Now I hope that inference is wrong. I hope it is incorrect, because it would be indeed alarming if the policy were now permitted to reach into the area of research, finding out information, releasing it and making it available. But it seems to me that if you're going to have a policy that says, "We're going to wait for peer review, we're going to wait until it has been scientifically tested, and then we're going to release it," it should apply to information which both tends to support or tends to contradict the administration's policy, or vice versa with respect to those of us who have a contrary policy.

I would appreciate your comment on that.

Mr. THOMAS. Senator, I can assure you the inference is incorrect. There is no attempt, nor will there be any attempt to manipulate the release of information that supports or doesn't support our policy. Our policy, as I have indicated and has been indicated before me, is that we think acid rain is a problem. We think, however, there are numerous uncertainties associated with the problem, as well as the effect of the problem, as well as the solutions to the problem. We don't think that now is the time to recommend additional controls, or to recommend that no additional controls are necessary.

One leg of how we are dealing with that problem is an accelerated research program. The accelerated research program, as you have indicated, is bearing fruit as far as results are concerned. It is very important that we release the information as the information is available for use by you and others who are very concerned about this problem as well. The two specific examples you cited, I

think it's important that we talk through how that process is working, and I am going to ask Dr. Riordan to talk about the "Eastern Lakes Survey" and Dr. Shea to talk about the southern forest report that you indicated.

Courtney.

Dr. RIORDAN. Yes; if I may, I would like to start by saying first that that was a letter report to the Administrator, a commitment to which was made long before the results of the lakes survey were known. We had built that into our communications process for this lakes survey, recognizing how sensitive this kind of data was going to be, so I will say we can show you the record that that was a commitment long before we knew what the results of the survey were going to be.

Senator MITCHELL. But you, Dr. Riordan, are well aware that many persons, including myself, including the chairman of this committee, seriously question the methodology and the assumptions and the processes by which that survey was conducted, and so you made a decision to release it with considerable fanfare before anybody had a chance to look at the study and raise the kinds of questions that we think are legitimate, and did it, as I said, with a press release and a summary report which does not itself contain the data and makes it very difficult to assess it. You know—we are all involved in a political process—that that first impression gained from that press release is and will continue to be the dominant impression regarding that survey.

Dr. RIORDAN. If I could, then, I will talk about the process of the peer review, but first I would like to talk about the release. In fact, the release of the data—that particular sentence picked out of the letter from our Assistant Administrator to the Administrator—does not reflect how the data was presented when we made it public. I think if you go back and examine how the data was explained when we presented it to the public, it could be interpreted both ways.

For example, if you look at the lakes in the Northeast, in looking at alkalinity we found 19 percent of the lakes in the Northeast had alkalinity less than 50 microequivalents per liter, and that was pointed out, that this is the area in which one would expect lakes to be very sensitive, depending upon what is going on in the subsurface in those areas. Similarly, 60 percent of the lakes in the Northeast were found to have alkalinities below 200 microequivalents per liter, which is the upper limit of sensitivity. That was all explained in the release of the data, which gave you a good scientific answer, namely that we don't have a conclusion, unfortunately, as a result of phase 1 of the lake survey.

What we do have as a result of phase 1 of the lake survey is an indication that the number of lakes that have PH below 5 is not greater than we had expected at the present time, so I think in terms of releasing the data we very much explained what the status of the situation was. In fact, in the Southeast we were surprised by the number of lakes that are acid. We ended up with a larger number of lakes acid in the Florida area than we had expected, so relative to the release, I think we tried to put it in the proper context.

In terms of the design of the lake survey, the lake survey certainly has had criticism from the scientific community and elsewhere, as often these accelerated applied projects do. However, that lake survey was peer reviewed twice in the design stage prior to us going into the field and collecting data. That's one more time than we usually do, and I think that from our point of view as scientific managers, we made the decision to go forward because, on balance, the data would be useful.

Senator STAFFORD. The Senator's 10 minutes have expired. We are planning a second round, I would say, gentlemen.

Senator MITCHELL. All right. Thank you, Mr. Chairman. Then I'll get back to this with Dr. Shea on my second time. Thank you very much, Mr. Chairman.

Senator STAFFORD. Senator Baucus.

Senator BAUCUS. Thank you, Mr. Chairman.

Mr. Thomas, I think it is instructive and helpful, frankly, to go back to the first question that Senator Mitchell asked, and that is, when do you think that the EPA will be in a position to recommend certain policies with respect to acid deposition? Your answer is, well, you don't know because it is impossible to tell. That is basically your answer.

Nevertheless, you have been studying this problem some time now. You have some familiarity with it. My question is, what is your best guess as to that date?

I'm not going to hold you to it, but what is your best guess? You know a lot about the problem. You know a lot about the subject. You have studied it thoroughly, so what is your best guess as to when the EPA and/or the administration will come up with a policy recommendation?

Mr. THOMAS. Senator, let me say first that the issue of policy review on acid rain is an ongoing issue, and I am involved in that policy review both within my agency and within the administration, so the issue of when will there be discussion of policy as far as acid rain is concerned is, it's an ongoing discussion as to when I would be at a point of recommending that additional controls over and above the Clean Air Act may be necessary for certain pollutants, for certain areas, or that they may not.

As I indicated to Senator Mitchell, based on the kind of research program that I see and when I think the findings are going to begin coming in related to the issues that we have talked about, I think the next 2 to 3 years is the time frame within which there is going to be far more information available to me than I have got today, associated with those uncertainties.

Senator BAUCUS. So you don't expect any recommendation for 2 to 3 years?

Mr. THOMAS. No, that's not what I'm saying.

Senator BAUCUS. Then what are you saying? What is your best guess?

Mr. THOMAS. What I'm saying is, somewhere between now and the next 2 to 3 years, as we have continual review of this policy issue—and there will be review—I think in that period of time you will see the uncertainties reduced substantially as far as the scientific issues are concerned.

Senator BAUCUS. Sometime between now and the next 2 or 3 years?

Mr. THOMAS. Right.

Senator BAUCUS. Do you think that's going to be a month from now, a year from now? What's your best guess? Let's pinpoint this a little bit more.

Mr. THOMAS. Well, when we make decisions in our agency based on risk assessment, we make risk management decisions, we have uncertainties associated with that risk assessment in many cases. In this case I think there are probably far more uncertainties than there are in most cases I deal with, so I would say that as far as my recommendations and reducing those uncertainties on this risk to the point that I would make a risk management decision, you are probably—a risk management decision concerning the need for control or no need for control—you probably are talking about the 2 to 3 year period of time from now as opposed to the 1 month to 1 year period of time from now.

However, I would hasten to add, if from our research or from the international research that is underway or from independent research that is underway, if information came in to me that showed that the risk was greater of an immediate impact from no control, or if research that I am certainly not managing but has been managed in other spheres reduced the uncertainty substantially in one of these areas, to allow me to draw conclusions, those things are all going to be factored in, so those are the caveats I would put on it.

Senator BAUCUS. Many people think that there is too much data gathering and not enough analysis. That is, there are lots of studies that just gather the data, compile it in big reports, but the EPA and their scientists and others who are involved in this are not sufficiently analyzing the data. What is your response to that?

Mr. THOMAS. Senator, there generally are two parts to this issue and, as I indicated from the research program that is underway, it is dealing with both parts, both gathering the information, analyzing the information, and drawing conclusions on things like, "What is the extent of the damage?"—on things like, "What is the prognosis for the future?" Obviously that is an analysis component. As a matter of fact, I would say the vast majority of the work, when I talk about results over the next 2 to 3 years, comes from analysis, but the analysis is based on the gathering of data.

One of the things that you find is, we are dealing with information—for instance, when I talk about dry deposition or wet deposition monitoring, one, we had to have the monitoring system in place; two, we had to gather the data over a period of time. Then the analysis begins. In fact, I think that's where we are in any number of these issues, so I think a substantial amount of analysis is underway and will continue, with results from that analysis.

Senator BAUCUS. As you probably know, Mr. Thomas, there have been several studies showing that the national parks in the Rocky Mountains—the Glacier National Park in Montana, the Yellowstone National Park—that those parks are vulnerable to damage from acid rain, acid snow, and nitric oxides. Yet, at the same time, we hear no reaction from EPA or the administration commenting on those outside studies. I wonder if you could now give us your reaction to some of those, some of those comments?

Mr. THOMAS. As you know, Senator, a good portion of our program is relating to some of those areas. As I indicated, the western lakes survey that is underway now, the monitoring networks that have been established, the direct delayed response program all have either direct or indirect bearing on the issues you are raising concerning those particular areas. But to respond to the specific studies, let me ask Dr. Riordan if he would comment on that.

Senator BAUCUS. Before I get into that, while you are answering, Dr. Riordan, as you probably know Science magazine published an article based, I think, or paid for or conducted by the Environmental Defense Fund, demonstrating a statistical correlation between smelter operations and acid deposition. I am curious, if an organization like that can publish in a respected scientific journal a correlation, why can't the EPA with more resources come up with some kind of study which either shows yes, there is a correlation, or no, there is just no correlation? It seems to me if an organization, an outside organization, can publish an article in a very prestigious scientific journal of its findings, then why can't the EPA come up with something?

Mr. THOMAS. Courtney, do you want to answer the first question, and then we'll get into the second one.

Dr. RIORDAN. Yes. I think that the fact that an article appears in a scientific journal gives it the presumption that it has an approach that's correct, but one of the purposes of publishing in a journal is to state your methods, your analysis, and your conclusion so that it can be subject to the overall community review and interpretation.

We have read the Michael Oppenheimer paper and, through NAPAP, we actually established a workshop to review that and try to come to conclusions as to whether the approach is worthwhile to pursue more vigorously in order to come up with the relationships that he thinks he has established as a result of the data he has analyzed. Unfortunately, I have a draft of that report right in front of me at the present time, and I think one of the particular reviewer's comments summarizes the situation relative to that paper.

The comment basically says the approach is sound—Oppenheimer's approach is sound—however, subject to very large error induced by the short precipitation data bases that he uses in the analysis, the large errors in the emissions inventory estimates that are used in that correlation, as well as the statistical arguments and the statistical methods not holding up if you analyze what it means in terms of fiscal reality.

Let me add, though, if I may, Senator, that we are in the process, however, of analyzing precipitation data as best we can as part of the 1985 assessment, and we are using methods that have been developed by numerous researchers in the area. We think we will have the state-of-the-art statement relative to analysis of wet deposition trends in the United States in our 1985 assessment.

Senator BAUCUS. Who was the reviewer?

Dr. RIORDAN. There are a number of reviewers.

Senator BAUCUS. Do you have the name of the reviewer that you are referring to?

Dr. RIORDAN. I probably do, but I might be violating a confidence.

Senator BAUCUS. Do you have it there?

Dr. RIORDAN. I do; yes.

Senator BAUCUS. You do have the name of the reviewer there?

Dr. RIORDAN. I do; yes.

Senator BAUCUS. Well, who was the reviewer?

Dr. RIORDAN. This particular review, it was—that was Ken Rahn and Randy Borys.

Senator BAUCUS. Are they—

Dr. RIORDAN. They are working in the field, yes.

Senator BAUCUS. They work for—

Dr. RIORDAN. Anybody in this workshop—

Senator BAUCUS. But are they privately funded or—

Dr. RIORDAN. They are out of the University of Rhode Island and Colorado State University, respectively.

Senator BAUCUS. OK. Could you also address, if you could, Mr. Thomas or whoever is most relevant here, the degree to which EPA is going to study this new plant down in Mexico? I guess I've forgotten the name of it. It's like Nacozari.

Mr. THOMAS. Nacozari.

Senator BAUCUS. The Nacozari plant.

Mr. THOMAS. And the smelter at Cananea as well.

Senator BAUCUS. The plant in Mexico which is going to emit, as I understand it, 550,000 tons of SO₂ annually, which would be by far the largest single source emission. It seems to me that's a good opportunity to study the effects of emissions from that plant on us in the West, particularly because it is a large single source, and contrast that with the East where there are so many different sources it's hard to identify one source and correlate it with a deposition someplace. What is EPA doing to monitor that plant?

Mr. THOMAS. Senator, we are doing several things. One, as you know, we have entered into an agreement with Mexico related to those two smelters down south of the border, as well as the smelter north of the border in Arizona, the Phelps Dodge smelter, related to controls on all three of those smelters, not long ago. As a matter of fact, a team from EPA and State is at this time in the process of discussions with Mexican counterparts in Mexico City related to controls for those smelters.

I would indicate and emphasize that the controls that we all agreed to—Mexico and the United States agreed to—on those smelters by 1988 are full controls, including acid plants that could be put on the smelters, both the United States side and the Mexican side, a timeframe that we felt was a stringent and realistic timeframe. But, importantly, we talked about interim controls before those were put in place, and that's where the negotiations are largely centered.

Senator BAUCUS. I appreciate your response. I see my time is up. I would just encourage you. It seems to me that Mexico shouldn't be allowed to pollute. That's No. 1. No. 2, it's a good opportunity for the EPA to factor that into your studies, to find out what correlation there is. Thank you.

Senator STAFFORD. Thank you, Senator Baucus.

Senator MOYNIHAN. Mr. Chairman, may I say that our colleague, Senator Hart, will by now have long since been blown to bits by the Russian artillery, and it's my time to charge in in his place, so if you will excuse me, I will go off to the floor.

Senator STAFFORD. Certainly.

We will start a second round, and at the outset let me say, Mr. Thomas, that I shall think about and consult with you and my colleagues later on the question of whether or not we should have another hearing sometime next winter to cover some of the areas we haven't been able to get into this morning. If you are agreeable to that, we will discuss it at a later time.

Mr. THOMAS. Certainly, Senator.

Senator STAFFORD. For Senator Symms, who unavoidably had to leave for the floor due to Gramm-Rudman, I would ask this question, probably to be answered in writing with a letter to this committee and a copy to Mr. Symms so he will know we did it. The question is: We provided in the Clean Water Act for a study of water quality in Lake Pondaria, Idaho's largest lake. It has been Senator Symms' assumption that the deterioration in the lake has been due to pollutants coming in with stream inflow. Is there any evidence, however, that acidic precipitation has contributed to the problem in the lake. Whoever you might ask of your colleagues to respond to that, I would appreciate if it could be done.

Mr. THOMAS. Senator, we will respond to that in writing.

Senator STAFFORD. All right. Thank you very much.

I would like to reserve to all the Members who are not able to be here this morning the opportunity to submit some questions in writing if they wish to, to be responded to in writing at your early convenience. Would that be agreeable?

Mr. THOMAS. Certainly.

Senator STAFFORD. All right. Now let me continue to focus on the subject of the timely collection and sharing of information. The Energy Security Act of 1980 directs the annual report of the task force, in addition to detailing the progress of research, to contain recommendations to Congress and the appropriate agencies about action to be taken by these bodies to alleviate acid deposition and its effects. The task force has failed to fulfill this obligation so far. I would ask why, and can you assure us that you are now formulating recommendations to be presented in the 1985 report?

Mr. THOMAS. You are referring specifically to the annual reports?

Senator STAFFORD. Yes.

Mr. THOMAS. I think, as well, talking about the 1985 assessment, which was a compilation report of information over several years.

Senator STAFFORD. Yes, I am.

Dr. Riordan.

Dr. RIORDAN. Yes, Senator. In terms of the annual report, I must admit I am one of the guilty parties that has to defend the lateness of those reports. I think the primary reason for the lateness of the reports has been the elaborate review process that we have used in order to get those documents reviewed through the agencies and through NAPAP and finally publish them. But, in addition, we have relied heavily upon what I would call forced account resources to do those annual reports. Running the operation by committee, no one was paying sufficient attention to the process to make sure that we met those deadlines. I think with the designation of a new executive director who has that immediate accountability for those reports, that we will see a change in the schedules.

Mr. THOMAS. Specifically related to the 1985 report, Dr. Kulp is managing the process that is leading toward that major assessment report, so maybe he should respond to that one.

Dr. KULP. Yes, first with regard to the annual reports, the one for 1985 will be available to you by July 1, 1986. That will be shortened quite considerably.

So far as the 1985 assessment document, which is the first attempt to bring together the results of the NAPAP Program and related research worldwide, we are aiming to get that completed in the spring of 1986. The 1985 assessment will be essentially a state-of-science critically reviewed, and from there the integration of the effects from one of these areas of research to another, so that the total impact of the effects will be considered, the total impact of the emissions will be considered, and such other relationships as we can state at that time.

Senator STAFFORD. All right. Thank you.

Senator Baucus has just left but he has requested that the committee obtain a copy of the critique of the Science magazine article which Dr. Riordan was quoting. Will you be able, Dr. Riordan, to leave a copy of the critique with us?

Dr. KULP. Yes. We have got that underway already. The indepth review occurred on Monday of this week, headed by Dr. Lester Machta, and we had people from universities outside. That will be put together and made available.

Senator STAFFORD. Thank you.

Now, Mr. Thomas, first by way of an oral request and then by letter on October 10 of this year I requested the data collected during the course of the Eastern lakes survey. My recollection is, you replied in a letter dated November 8 that, "It is the policy of EPA not to release reports on data bases prior to the completion of peer review." For this reason, you provided the committee with a limited amount of information but declined to supply the full data set.

Despite the fact that it is the established policy of the Agency to withhold data until peer review is completed, the Eastern lakes survey was discussed, apparently, and characterized by EPA officials at an August 29, 1985, symposium on acidic precipitation held in Canada during the week of September 15, 1985. A paper entitled, "Effect of Acidic Deposition on the Chemistry of Aquatic Ecosystems in Eastern North America" was presented by four authors, two of whom are officials of EPA. The abstract of that paper states that the data sources include the Eastern lakes survey. An attendee at the conference has advised the committee that the survey data were discussed extensively and that the science appeared good.

If it is the agency policy to withhold data until peer review is completed, why was it characterized and discussed at the press conference, as well as discussed at an international scientific symposium, but not provided to this committee?

Mr. THOMAS. Senator, let me ask Dr. Riordan to discuss the process we have used, both as far as release and the peer review process, and the status of it related to the Eastern lakes survey.

Dr. RIORDAN. The paper deals with the same data that was in the press release, Senator. There was nothing more presented at the

symposium than was presented in the press release which occurred earlier. At the present time that is only dealing with data and summaries of the data. There is no analysis or interpretation associated with the data to date.

As of December 16 we will have a report analyzing and interpreting the data that will be peer reviewed between now and January and, assuming there are no major problems developed in that, we expect to release the full analysis and interpretation of the report by February of this year.

Senator STAFFORD. Well, we will look forward to getting it then.

Senator MITCHELL. Mr. Chairman, may I just have a brief follow-up on that? I didn't understand what he said.

Senator STAFFORD. I understood him to say—

Senator MITCHELL. I thought Mr. Thomas' letter to the chairman said the peer review process would commence in January. Now you're saying it will be over in February?

Dr. RIORDAN. For the report. This is the report of the lakes survey. December 16 is when we are scheduled to deliver the report to the peer reviewers.

Senator MITCHELL. Oh, I see.

Senator STAFFORD. I understood Dr. Riordan to say that he would have it so that we might get it by February 1986.

Dr. RIORDAN. However, if major problems are identified, then we are anticipating a March delivery if there is a major rewrite necessary because there are internal problems in the document.

Senator STAFFORD. We won't be completely unreasonable, but as soon as you can supply us with that, we would appreciate having it.

Dr. RIORDAN. Surely, Senator.

Senator STAFFORD. One final question? I still have a couple of minutes left. What is the process used to make decisions regarding release of results from NAPAP's research efforts?

Dr. KULP. Well, there are two levels of release. First there is the quality of the data itself, and of course it is essential that this be very carefully, critically reviewed, calibrated, standardized, so that poor or incorrect data does not get out in the public domain or even waste the time of other scientists attempting to analyze it, so step one is to verify the data. NAPAP, through EPA, has a very strong quality control program for the data.

Once the data has been qualified, then the next step is the peer review of the interpretation of the data, and in that level we use not only internal people—the scientists who did the work—but also outside people within Government laboratories and the universities. After that peer review process, then it is truly available.

Now the NAPAP goal is that virtually all of our scientific reports go into the peer reviewed scientific literature. There are some cases we can't do that because it would protract it too long, and so in the interim there is an internal publication.

Senator STAFFORD. All right. Thank you. Thank you all very much.

Senator Lautenberg, for your second round?

Senator LAUTENBERG. Yes. Thank you, Mr. Chairman. I'll try to be brief. I just wanted to come back to something that Dr. Kulp said when we were talking about equilibrium. You suggested to Senator Hart that the deposition inputs in the lakes in the North-

east had remained somewhat constant for some time. These lakes were close to equilibrium and their acidity was unlikely to change. You feel confident of that, your support for that statement, obviously, by your response. Is that a fair assumption?

Dr. KULP. Yes; that I would not expect a significant number of lakes to change abruptly in the near future.

Senator LAUTENBERG. Right, but yet when the NAPAP report was being given by Lee Thomas, they said that this Eastern Lakes survey is only a snapshot, and yet your conclusion is that equilibrium exists. That requires a broader knowledge, doesn't it, to make that statement with such conviction?

Dr. KULP. Yes. Well, the detailed work will come in phase 2, where we will be looking at the pattern in the lakes throughout the seasons. We will be looking at the episodic event that occurs with snow melt in the North, and this will give us much more detailed information on the history of the chemistry, but I don't expect that that will indicate that many of these lakes are at the edge of disequilibrium.

Senator LAUTENBERG. I don't want to challenge your knowledge base but there are people here who tell us that when titration—the process of mixing, I guess, is the simplest identification—that when that process takes place, that even though the input is fairly constant, the acidity can change rapidly. Is that fair to say, at the point of mixing, of titration?

Dr. KULP. If the deposition started a year or two ago, you would look for something perhaps that would be quite sharp. The longer the term of the deposition, the slower will be that titration effect.

Senator LAUTENBERG. But, again, that statement is made with some reservation, I assume, because again the scope of the study isn't broad enough.

Dr. KULP. Yes. It's a time-rate process.

Senator LAUTENBERG. I guess, Lee, the thing that concerns so many of us as, I hear the questions and the responses, is the availability of information without necessarily following the course of the program that would be ideal to get material out there, and even perhaps in the hands of some of us nonscientists the information would be of value and interest. The chairman has a letter from the American Institute of Architects in which they talk about the substantial damage to buildings and facilities and they make a fairly unqualified statement. They say, "Acid rain is literally eating away our built environment." This is November 14, 1985, fairly recent, and this is signed by the president of the American Institute of Architects.

Then there are all these damage estimates that we see, and I recognize that one can challenge the fact that some of the basic components of the research may not be precise; research is faulty. Mr. Winters challenged the statement made by the Brookhaven people on the 50,000 deaths—said it was "controversial," I think, but "controversial" doesn't necessarily mean it's wrong—isn't that fair to say?—or that the assumptions are incorrect. So we get into this cycle of breathlessly waiting, like the terminally ill patient who wants to hear the doctor say, "We've found a cure for the disease, and here it is," so you understand our urgency.

Then I get a report from Mr. Laroe, Research and Raw Materials Damage, to Mr. Morganstern, Director of Policy Analysis at the EPA. He is talking about the economic materials damage assessment by OPPE for the 1985 acid rain assessment:

After being briefed by DOE, the executive committee of NAPAP decided to hold back release of the short form materials section of the 1985 assessment.

He refers to:

And I have been invited to discuss our side of the controversy at the next inter-agency advisory committee meeting on September 5th.

Then he goes on to elaborate later on about the damages to painted surfaces that are large and so on.

Is there a reason for holding back on this kind of a report? Is there something more that we ought to know before an evaluation by those of us not in your group takes place?

Mr. THOMAS. I believe that is the specific document—maybe Courtney can respond to it—that is in the process of peer review right now, which is the materials effect draft report that was released earlier, so that kind of review and discussion of issues is a part of that process.

Now, Courtney.

Dr. RIORDAN. It is, specifically; yes. That arose as a result of the review that we held of the damage functions that were critical in coming up with the estimates of economic costs of damage. They had been reviewed by a panel that had been established through the Department of Energy and the other agencies, and some of the reviews were very strong in their comments about questioning the supportability of some of the damage functions.

As a result of those questions that had been raised by peer review, we in the executive committee decided that we ought to go back and examine the draft document for the assessment that included numbers based on those damage functions before we sent it out for extensive review, the main reason being that we felt that you shouldn't send out a document that had a cloud over it for wide review because of the possibilities that that document was going to be made public, and then you would create the problem all over again of false information being given to the public, and we are put in the defensive position of defending a document that hadn't had adequate scrutiny in the first place. So it was a matter of simply trying to take a responsible approach toward sending a document out for review.

Mr. THOMAS. Senator, one other point I think that you have made—and let me just emphasize one more time—the 1985 assessment document that is in process now of being completed and reviewed is a comprehensive review of the state of scientific knowledge, not only within this research program but beyond this research program in other parts of the community, on acid deposition. So, for instance, the materials issues you are talking about as well as many of the other issues we have discussed, from aquatics to forests, are incorporated in that.

This program produces annual reports, produces individual scientific papers, produces extensive data for analysis that goes through a process of being released. That 1985 assessment is an example of a major document that is close to being produced, to be made avail-

able to you and to the community at large, as the state of science as far as acid deposition is concerned.

Senator LAUTENBERG. Except that, I think, Lee, that is challengeable by the fact that some materials are released with specific markets or specific communications opportunities when it is judged that it is timely by NAPAP. I think that was the point that Senator Mitchell was earlier making.

But I want to, Mr. Chairman, conclude with this: That as a society, Lee, we make lots of decisions in the face of uncertainty, and our job is to weigh the available evidence and take the prudent action as we see it, again, never absent uncertainty. There is uncertainty about how the data may be developed, but there is no uncertainty about the fact that there is damage to our community, our country, as a result of acid pollution. There is a question, certainly a large question, about the damage to health, and there is a preponderance of evidence that says we ought to be able to get going on some kind of an implementation program to reduce this material far more than we have.

The stakes are so high. We don't want to be like the mortician or the physician performing the autopsy that comes to the conclusion that yes, we know the cause of death, but death has taken place. We don't want to be too late. I want to refer you to something that the President's task force on acid rain said, and that is—in the Office of Science and Technology Policy—and that is, they recommended controls, stating that the risk of waiting outweighs the risk associated with acting prematurely. I think that is the condition, certainly, that I find myself in, is that we are looking for something that cuts the damage, reduces the risk as much as possible.

That's why I would ask you, through whatever opportunity you have to move these things along, to make the recommendations, to give us the opportunity to make the decisions here that affect these things, and that we feel necessary to make reduce this affliction on our country.

Mr. THOMAS. Senator, if I could just make one comment, I think you defined well the process that we as individuals, as well as I as the Administrator, go through all the time, and that is making risk management decisions. I would say in this decision that there are three big areas that we have to look closely at when we make that risk management decision.

One is, what is the extent of the problem we're trying to deal with? We are trying to determine what the extent of that problem is, and there is tremendous uncertainty there.

Second is, what are the impacts of the solutions that may deal with that problem? There are tremendous uncertainties there that we are trying to come together with.

And, finally, how effective are the solutions that we develop? Tremendous uncertainties there.

Reducing the uncertainties under those three big areas is what research, policy analysis, and State-Federal implementation analysis review is all about. We are doing that while we are continuing to implement the Clean Air Act.

Now I as the Administrator, as I work on that, will come to a point where, as you say, I will make recommendations, either that there is still too much uncertainty to suggest additional solutions

beyond the Clean Air Act; or that the risk is greater than I thought it was today and therefore we need to move now, even though there are great uncertainties; or that I have concluded that additional controls are not necessary beyond those under the Clean Air Act. That, in fact, as you indicate, is exactly the risk management process, the risk assessment-risk management process that we are pursuing.

Senator LAUTENBERG. Thank you, Lee.

**STATEMENT OF HON. ALAN K. SIMPSON, U.S. SENATOR FROM
THE STATE OF WYOMING**

Senator SIMPSON [presiding]. Thank you, Senator Lautenberg.

The chairman was called away and I will just chair for a moment and make a few brief remarks. I think I'll turn it over to you, George, to conclude.

I just want to say that I appreciate the chairman's continuing interest in this subject, and certainly the interest of the Senator from New Jersey, whose State is perhaps more affected in some ways with regard to environmental conditions than any other State in the Union, with regard to toxic substances, hazardous waste, the impact of acid rain, and certainly the Senator from Maine, George Mitchell, with the problems of the Northeast.

I just wanted to touch just momentarily on the fact that we do not, in the West, just look upon our eastern neighbors as having the problem. I think that it is very definitely something that is a national problem, an international problem. Indeed, in my home State of Wyoming I want to commend the EPA for their study of the more than 100 high mountain lakes and the material that was gathered there this year with regard to that. The sampling that was done, revealed that apparently there isn't anything near what is found in the East, and yet when you consider buffering capability and the photosynthesis, even considering another item which is described as "episodic aspication," which we call runoff out in our country in the spring, and what it does, that's a consideration, too.

I want to commend the EPA on that, and just want the rest of the panel to know that we look upon it as a very serious issue in that part of the United States. There are so many aspects to it which you describe as "uncertainty," which will quickly and has already translated into "frustration," further defined into "impatience," further defined into doing something which doesn't have anything to do but finding the victim and then saying, "We really don't know how this happened but we've got to compensate it." That is something we have discussed before, and I won't discuss it here again. There are many culprits here, SO₂ and NO_x and automobiles and organic compounds, and there's plenty to go around.

I regret that there is a \$750 million study on clean coal. It would have been, it seems to me, more appropriate to direct \$750 million to acid rain, if you're going to do something, instead of trying to figure out how to promote one form of high-sulfur coal or get it into a condition where it competes with low-sulfur coal, and we get back into that regional struggle again, how do you peddle coal? Then we come to the issues like percentage reduction, and I won't get into that horror story and all that.

I think it's important that we realize that the frustration level gets higher, and as it gets higher we look for results which may or may not be to the best interests of all. I deeply appreciate the chairman's intense interest and the intense interest of my colleagues on the committee. I appreciate what the EPA is trying to do.

With that, I have some questions that I would submit in writing and ask you to respond, and with that I think I will give this gavel—an honorary gavel, properly inscribed—to George Mitchell of Maine for his use, however he may see fit—within reason, of course.

Senator MITCHELL [presiding]. I thank you, Mr. Chairman.

I would like to pursue the line of inquiry in which I was engaged when my time ran out in the first series of questions, which deal with the release of information. Before I do that, Mr. Thomas, I was interested in your response to Senator Baucus' question in which he elicited from you a "best guess" as to when you would be in a position to respond. We recognize that it is just that, a "best guess"—2 to 3 years.

As you know, in just about 3 months the President will be meeting with the Prime Minister of Canada, and unless the President adopts a position radically different from that which you have expressed here today—which I think no one expects—I think Prime Minister Mulroney is going to be very much surprised. It is going to come as real news to him that we've got 2 or 3 more years to consider this before we reach any decision at all as to whether or not we are to embark upon a control program and, if so, what the nature of that will be.

It will, I think, confirm the views of many people in Canada and in this country that that meeting last year and the appointment of a special representative on each side was nothing but a sop to the Canadian Government, to in effect defer action on this for another year. I hope very much, for the sake of the Canadian people, not to mention the people in affected parts of this country, that the Prime Minister will be somewhat more vigorous this year in pursuing the Canadian position.

I also want to comment, Mr. Thomas, on something you said. You have indicated three areas of uncertainties, and you are undoubtedly correct in your identification of those areas, and suggested that you are moving to reduce them before making your decision. I would remind you that there were similar uncertainties when the Clean Air Act was adopted. There were similar uncertainties when the Toxic Substances Act was adopted. There were similar—although I think, in fairness, to a lesser extent—uncertainties when the Clean Water Act was adopted. There were in fact uncertainties attendant upon every piece of environmental legislation ever enacted in this country.

There is in every public policy decision a continuum of information that starts with zero—you don't know anything about a problem—and ends at 100, and the determination at what point enough knowledge exists to adopt a policy is a political decision. The administration effort is obviously to suggest or to create the impression that this is somehow entirely a scientific problem, and that somehow, somewhere, if we do enough research, a scientific answer

will emerge, but that is not true. That is not the case here, as it was not the case with the Clean Water Act, as it was not the case with the Clean Air Act, as it was not the case with the Toxic Substances Act.

We know something about the problem. The decision as to when we know enough to take action is not a scientific decision, it is a political decision made in a democratic society, and it is a subjective judgment on the part of policymakers as to when that information is sufficient to justify some form of public policy action. I think it is very important to make that point because, while we welcome the information received here today—and I want to make very clear, Mr. Thomas, again I repeat what I said, I personally have great respect for you. I think you are doing a very good job as head of the EPA. Nonetheless, all of this effort which seeks to support the conclusion that somehow, if we just do enough research, a scientific answer will emerge like the jack out of the box and that's going to be the answer, that's just not true. That's not correct.

That's not the way public policy is made in a democratic society, and I think it is clear to me beyond any doubt that we have passed the point where we have enough information to act, and that the decision not to act is a purely political decision, consistent with the administration's overall environmental policy but having nothing to do with the reality of the situation in which we find ourselves. I think it is very important that that point be made, lest it be obscured in all of the talk about science and research, as though that is going to provide public policy responses.

Now with that—and I apologize for the length of time—I would like to get to the final part of the response to my earlier question. We have now heard from Dr. Riordan as to how and why it was that the Eastern Lakes survey—at least information regarding the Eastern Lakes survey—was released at a time prior to peer review and prior to making a full report available.

The second part of the question, then, is why was not that same process followed with respect to the interim report on softwood growth trends in the Southeast?

Mr. THOMAS. Senator, if I could just lead into that, if I could, by responding just briefly to your comment on public policy by stating—

Senator MITCHELL. Take whatever time you want, Mr. Thomas.

Mr. THOMAS. Thank you. By stating that I agree with you in your statement of how public policy decisions are made. I agree with you that we often find ourselves, if not always find ourselves, with a degree of uncertainty, particularly scientific uncertainty, when we come to conclusions on public policy. Ofttimes in Congress, frequently within the administration, it is that uncertainty that makes my and your job a difficult job, but we make public policy.

I think you agree with me, as well, that particularly when we deal with issues where science is the basis for a decision or one of the basic components of how we arrive at that decision, an important ingredient is hopefully the certainty of the scientific information that is available to us in making that decision. It's not the only basis for the decision, and there I agree with you.

Where I disagree with you is, and where I think reasonable men disagree, is at what point are you ready to make your public policy decision? I think my suggestion is, we are not at the point where we feel additional controls are warranted. We are also not at the point where we are ready to say additional controls are not warranted—either way—and we do feel the scientific information that will be available to us will be significant information and will be extremely helpful to us in making that public policy decision.

Senator MITCHELL. Well, I just want to say, Mr. Thomas, that it is no coincidence that the time period you have established for reaching a decision coincides roughly with the conclusion of this administration's term in office. I submit to you that the record of the past several years makes it abundantly clear that that question will never be answered during this administration's term in office. It will be left to others to make that policy decision, and that is because there is a preordained political decision not to act. All that is occurring is to provide substantiation and a continued basis for making that decision.

Mr. THOMAS. And, Senator, obviously as we have discussed now for 2 hours, I wholeheartedly disagree with your conclusion.

Senator MITCHELL. Well, I understand that. I understand that, but I will say this. Boy, if I were sitting on a jury on this one and had all the evidence, not just of this hearing but of all the hearings we have had in the past 5 years, it is impossible to reach any other conclusion.

Why don't we hear now from Mr. Shea?

Dr. SHEA. Yes, Senator. I'm very pleased to have additional discussion on this question that you raised. First of all, I am very much concerned that there is a perception that information is being withheld. I can say categorically that is not the case.

Very early on in the Forest Service forest inventory work, when the data began to indicate that there had been a diameter or a radial growth reduction, one of the things that we did at that time, we discussed this with the southern State foresters. We also discussed this with a number of scientists in the scientific community, seeking the best experts we could find to look at the data, to look at the way it was collected, to look at the types of analysis that had been done, and then also to establish additional analysis which we felt should be done so we could look at the total picture.

As a consequence of that, there was a lot of work took place and, as I mentioned, the publication or the material has been received from the publishers. It is at our southeastern forest experiment station and they are in the process of releasing the material, but there have been a lot of background discussions with the public.

The one thing I think I didn't mention in my earlier comments—

Senator MITCHELL. Let me just interrupt to say, I guess the question suggests itself, why wasn't the same procedure followed with this as with the Eastern lakes survey; that is, an EPA press release and an announcement to provide the kind of public highlighting of this information?

Dr. SHEA. Well, first of all, this particular work, the forest inventory work, is not part of the National Acid Precipitation Assessment Program. This is a Forest Service mandate to carry out a

forest inventory. Because of the concern of the possible effects of acid deposition, other environmental concerns, growth and so forth, this is why we brought this to the attention of the NAPAP organization of which I am on one of the committees, so basically that work was done independently of what is normally within the NAPAP activities.

Anyhow, to finish my comments that I mentioned earlier, the radial increment and the so-called basal area increment, we are still continuing to analyze the data that we have available, looking at them from the standpoint of has there been a reduction in volume, which is really the critical question, and these are ongoing activities, as well as looking at any inferences we can gain from the data as to possible cause and effect. Forest inventory data were not designed to answer questions, say, dealing with acid deposition. This is why, as I indicated earlier, we have joined forces with the EPA in looking at or developing a research program for southern commercial pines, so we are continuing that, but I want to assure you that data and information are not being withheld.

Senator MITCHELL. Thank you, Dr. Shea. That is very reassuring, and I acknowledge the need for much more substantial research in the area of potential forest damage. It is clear that the problem there at least appears to be somewhat more complex than the problem of injury to surface waters, that is, the possible combination of other pollutants is clearly at work, and the assessment of damage itself is somewhat behind the assessment of damage to surface waters. In view of the not only environmental but economic significance of our forests to many parts of the country, I am pleased that there will be continuing forest research.

I was delighted, Mr. Thomas, when you displayed the chart in that area. Those of us, at least some of us who support the need for acid control legislation, have always made the distinction of the extent to which information exists regarding injury to surface waters and the lesser extent to which it exists with regard to potential damage to forests, particularly, as I indicated earlier, in being able to attribute it to a single cause such as acid deposition, when in fact it appears more likely to be the effect of a combination of elements.

Well, I am very grateful to all of you. I apologize for the lengthy time that I and the other members of the committee have taken. This is, however, a very important issue to all members of the committee, and in behalf of the chairman I will declare this meeting adjourned.

[Whereupon, at 12:40 p.m., the committee recessed, to reconvene at the call of the Chair.]

[Mr. Thomas' written statement and a letter with attachment from the Alliance for Clean Energy follows:]

STATEMENT OF LEE M. THOMAS
ADMINISTRATOR
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

DECEMBER 11, 1985

Mr. Chairman and Members of the Committee:

I welcome the opportunity to appear before you today to discuss the acid rain problem. Since becoming Administrator, I have found this issue to be more complex than almost any other. Last summer I had the opportunity to personally visit areas in New York and Vermont where I viewed the effects of acid precipitation first hand. I hiked up Camels Hump and flew by helicopter over the Adirondack High Country. During that trip I was struck by the aesthetic and ecological value of these areas. That trip helped shape my strong personal sense of the importance and the complexity of the acid rain issue.

My appearance here marks the fourth time in less than two years that a Congressional committee has invited the Administrator of EPA to testify on acid rain. Administrator Ruckelshaus appeared before Congress on three separate occasions in 1984, and each time he described the Administration's acid

rain policy as well as its commitment to finding a solution. I quote from his March 1984 testimony: "The impact of acid deposition on the North American continent is of great concern to this Administration . . . When the fundamental scientific uncertainties have been reduced, this Administration will craft and support an appropriate set of measures to solve the acid rain problem."

Since Bill Ruckelshaus made that pledge, we have put forth a major effort to obtain the scientific, analytical, and administrative answers needed to craft that solution. It is this effort that I would like to address in my remarks.

As a way of providing an overview, I would like to return for a moment to the Administration's policy. As Bill Ruckelshaus testified last year, "There is no question that there is an acid rain problem in this country." Nevertheless, he pointed out that an immediate decision on additional controls would be inappropriate. We have made this determination not because we believe that controls are unnecessary or too expensive, but because it is premature and unwise to prescribe emission controls based upon our current scientific understanding of the problem.

In direct support of this policy, we announced and initiated an acid rain program made up of three parts: accelerated research, ongoing policy analysis, and Federal/State

studies of implementation issues. In addition, we have continued to pursue the active implementation of existing provisions of the Clean Air Act which control acid rain precursors. Each activity plays an important part in creating a coherent and comprehensive program.

RESEARCH

The most visible single element of our acid rain program is the research being carried out under the auspices of the National Acid Precipitation Assessment Program, or NAPAP. In 1980 the Congress passed the Acid Precipitation Act which established NAPAP as a 10-year Federal interagency research effort meant to clarify the scientific uncertainties of acid rain. It provides an umbrella structure for coordinating acid rain research conducted by twelve different Federal agencies and four national laboratories. All NAPAP research is funded through the budgets of the participating agencies which have full management responsibility for the research they fund. NAPAP receives no independent funding from Congress or conducts any research activities on its own. NAPAP's primary role then is acid rain research planning and coordination. To facilitate this planning, NAPAP has established its own internal management structure, a structure which has changed over time as the program has evolved. This structure is formally established by a Memorandum of Under-

standing among USDA, DOE, DOI, CEQ, EPA AND NOAA. The top level of management in NAPAP is the Joint Chair Council (JCC) of which I am chairman. Members of the Council are the heads of the six organizations that are signatories to the MOU. Through this arrangement, decision making for NAPAP budget and program direction is carried out by the same senior officials who make budget and program decisions for each of its funding agencies. This insures final coordination among individual agencies and NAPAP programs, plans and budgets. Reporting directly to the Joint Chairs is the director of research who is responsible for the day to day coordination and management of the research planning process. Also reporting to the Joint Chairs is the 20-person Acid Precipitation Task Force mandated by the Act. It serves as an advisory body to the Joint Chairs and the Program as a whole. The primary mechanism for research planning and coordination is the research task groups. The task groups are organized around major research areas like aquatic effects or atmospheric processes, and their membership is composed of research managers and senior scientists from the participating agencies. Together all of these components along with a few additional committees and panels make up the NAPAP management structure.

NAPAP's enabling legislation was passed early in FY 1981, consequently FY 1982 was its first budget planning year. In FY 1982 NAPAP's budget was 17.4 million dollars; in FY 1983 it was 22.7 million dollars. During those first two years NAPAP was able to integrate ongoing Federal research efforts into a national plan and to augment that effort with several new initiatives.

In 1984, the Administration announced the acid rain policy that I reiterated earlier. In response the Administration recognized the immediate need for an accelerated research effort targeted to those scientific uncertainties that most impede policy development. We naturally turned to NAPAP to address this need.

Because of this heightened concern regarding acid rain research, NAPAP underwent several significant changes:

First, the NAPAP budget was increased substantially.

Second, in defining research priorities, the need to address scientific uncertainties critical to policy development became a primary consideration.

Third, much greater emphasis was placed on achieving near-term incremental improvements in scientific understanding.

Fourth, scientific research and data assessment were more clearly separated from policy analysis.

Fifth, conceptualization and planning of major research projects benefited from an enhanced peer review process that included broad representation from the scientific community.

NAPAP CHANGES

The first and most obvious change in NAPAP was its funding growth. At a time when the Administration and Congress were committed to controlling domestic spending, both thought it appropriate to increase the NAPAP budget by a factor of three in three years. From a FY 1983 level of 22.7 million dollars, the NAPAP budget increased to 35.3 million in FY 1984, and to 65 million in FY 1985. The President's budget proposal for FY 1986 is 85 million dollars.

The changes in NAPAP were not limited to increased expenditures. The expansion in NAPAP research was consciously directed into those areas of greater significance to policy resolution. Our intent is not to simply increase our scientific understanding of acid rain; rather we want to concentrate on gathering the scientific information necessary to make a decision on the need for additional controls. Identifying the principal scientific uncertainties hindering policy development, and targeting research to reduce those uncertainties, have been two of our major goals over the past two years.

As a result of our major policy analytic effort in 1983, we gained a much clearer view of what kind of information is most needed to support policy development. For example, we discovered that existing data on the extent and magnitude of acid rain effects on aquatic systems were hampered by changes in methodology, inconsistent quality control, and the lack of a statistically based sampling design. Data on the extent, magnitude and causes of damage in forests were largely lacking. As a result, we have placed much greater emphasis on gaining information on aquatic and forest effects. NAPAP planning has responded by greatly expanding research efforts in both of these areas.

The third major area of change in NAPAP is closely related to the first two. When NAPAP was first organized, it established as its main goal the production, at the end of ten years, of an integrated assessment of the acid rain problem in the United States. Recognizing the need for expeditious policy resolution, it was clear that we could not wait ten years for a definitive analysis of acid rain. We needed answers, even partial answers, much sooner. Consequently, we have designed research projects that would lead to near-term and mid-term incremental improvements in scientific understanding. We have even tried to build short-term results into those important research efforts

that are trying to define long-term trends and processes. In short, NAPAP was put on a dual track. Besides being responsible for defining long-term trends, NAPAP was asked to improve scientific understanding more quickly and incrementally.

While we have attempted to target NAPAP research to policy-related scientific uncertainties, we are also keenly aware of the need to keep NAPAP science objectives unaffected by its policy implications. The task is to make sure that the selection of research priorities is responsive to policy needs but that execution of those priorities is carried out as free from policy influences as possible. We have attempted to address this problem directly by clearly separating the responsibilities for policy development from those of scientific research and assessment. The lead responsibility for acid rain policy development is in EPA's air programs, with the support of other agencies. Responsibility for science assessment and research is the sole responsibility of NAPAP.

Finally, much of the information being sought has forced scientists to examine problems at the borders of their understanding and at the upper limitations of their research methods. As a result there is a significant chance that some of the research could fail to meet its intended objectives. With the premium we have placed on near and

middle term results the consequences of unsuccessful research are high. Consequently, we have reaffirmed our emphasis on peer review during the research design and planning phase. As much as possible, we want research plans to be reviewed and approved by the scientific community before they are implemented. Research results will, as always, be peer reviewed before release. For example, the National Surface Water Survey underwent several peer reviews before it was initiated, and the Direct/Delayed Research Plan was reviewed at a workshop in March, 1985, by fourteen scientific reviewers before any field work began.

In addition, we have periodically reviewed major research efforts while in progress to ensure that we were still on the right track. Those reviews include special panels on the Regional Acid Deposition Model (RADM), and on the integrated assessment effort. NAPAP also conducts general reviews of each task force's programs on a regular basis. We would be happy to make the results of any or all of these reviews available to the Committee.

POLICY ANALYSIS

The second element of our acid rain program is ongoing policy analysis. It does little good to have a research

program generating better scientific information if no one is in place to use the information. We have an acid rain policy analysis staff which, in addition to other responsibilities, works with research managers and scientists to identify critical uncertainties, establish research priorities and review research results.

As you are well aware, a number of different approaches to controlling precursor emissions have been developed within Congress and both within the Executive Branch and the private sector. Most of these approaches have been reviewed by our policy analysts. In the past Committee members and staff alike have relied on EPA-sponsored analysis of major House and Senate acid rain bills.

The different control alternatives share a few general features. They all propose to control a certain amount of a specified pollutant emitted from a defined area of the country. But their differences often outweigh their similarities. They all pose different answers to a set of very complex questions:

- o What resources are to be protected and where?
- o Which pollutants are causing what problems?
- o How much should emissions be reduced?
- o Where should the reductions take place?
- o What techniques should be used to control emissions?
- o How should the reductions be timed?

- o What are the costs involved?
- o Who should pay?
- o How are economic effects to be mitigated?

What makes these questions especially difficult to answer is the fact that they are all interrelated. The answer to one question will shape the answer to another, and the answers to many depend upon an ability to understand and predict the physical and biological behavior of the pollutants involved. Thus, the ability of the policy analysis staff to make real progress is directly tied to the progress of NAPAP research efforts.

IMPLEMENTATION ISSUES

The study of implementation issues is the third major element of our current acid rain program. Implementation issues are the procedural, technical, and administrative barriers that can hinder or prevent the successful implementation of any control program. Seldom have we taken the time to anticipate and study implementation problems before enabling legislation was in place.

In the past implementation issues have often been the most critical link between legislation and environmental results. Unfortunately they also tend to receive the least forethought. Recognizing this problem we have chosen to use this time to analyze and develop contingency plans

for acid rain implementation. In pursuing implementation issues, we are not presupposing the need for additional controls. But if they are needed, we want to make sure that everyone, including the States, are ready to make them work.

We have been actively involving State governments in this effort from the very beginning, because they would almost certainly play a large if not dominant role in any potential implementation effort. This cooperative Federal/State program has received direct support from Congress in the form of a three million dollar add-on to EPA's 1985 budget for grants to State air programs. These State acid rain grants have now gone to thirty-four States.

I hope this part of our current acid rain program gives you some indication of this Administration's willingness to seriously consider the possibility of adopting new acid rain controls. Together with State governments, we are studying the very complicated problems that will most likely be associated with any major control program. This kind of anticipatory study carries with it real risks for everyone participating. Those States strongly opposed to controls are uncomfortable, because participation in the study implies a form of acceptance that control programs could reasonably be implemented at some point.

Those States advocating controls are uncomfortable, because the study implies that new control programs could be very complex and difficult to make work. However, most participants believe that if a control program were to be adopted, it should be managed fairly and effectively. So studying implementation issues now is in everyone's best interest.

I hope this summary description of our current acid rain program helps reemphasize in your minds the complexity of the issue and the pitfalls of oversimplifying it. The desire to simplify a problem, to reduce it to its most essential components, is natural and often beneficial. Simplification helps focus the terms of a debate; it helps develop consensus. But simplification can be counterproductive if it leads us to prescribe simple remedies that don't solve complex problems. Or if it leads us to prescribe simple remedies that lead to unnecessary and undesirable social and economic costs. I believe that the dangers of oversimplification are apparent in much of the current debate about acid rain.

Our acid rain program and NAPAP in particular is very complicated. Any 65 million dollar research program involving 12 agencies, four national laboratories, and hundreds of individual researchers is bound to generate controversy, both scientific and institutional. In pursuing our information needs, we have intentionally pushed the science and

the scientists to their respective limits in an effort to get timely answers. I am sure in that process we have made some good judgments and some poor judgments. But I believe, Mr. Chairman, we have always tried to make sound judgments.

Mr. Chairman, this concludes my testimony. Several members of NAPAP have accompanied me here today, and we are all prepared to answer any questions you or members of the Committee may have.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 15 1986

THE ADMINISTRATOR

Honorable Robert T. Stafford
Chairman
Committee on Environment
and Public Works
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

I am writing in response to your letter of February 12, 1986, in which you raised several additional questions following from my testimony before your committee last December. In addition, Senator Lautenberg has requested that several questions of interest to him be addressed.

Answers and discussions for the questions are enclosed. I am pleased to be able to discuss these points with you. If I can be of any further assistance, please let me know.

Sincerely,

A handwritten signature in cursive script, appearing to read "Lee M. Thomas".

Lee M. Thomas

Enclosure

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
WASHINGTON, DC 20510

The Honorable Lee M. Thomas
Administrator
United States Environmental
Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

This letter is to pursue a number of additional concerns that I was left with following your testimony in early December about the progress of the National Acid Precipitation Assessment Program. I would appreciate your responding to the following items.

In the August press release, the Goldstein memo stated that ORD policy has been predicated on "200 plus a few" acid lakes, and that a significant change in this number, if shown by the Eastern Lake Survey, would warrant a change in policy. Mr. Goldstein then characterized the Eastern Lake Survey results as supportive of EPA's original policy position.

Please state what change in policy will follow this significant change in the measured number of acid lakes.

In my letter to you of October 10, 1985, I expressed concern that sampling in the Fall gave values for acid neutralizing capacity, or ANC, higher than the typically low values found in the spring, following snow melt. (Lower ANC values correlate with higher acidity).

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ANC was lowest for the year and in some cases highest for the year. Checking these graphs carefully, we find that ANC was lowest in November only once; yet it was highest six times. Usually the lakes were most alkaline in mid-winter, when the acid deposition is locked in snow and ice and therefore kept from the lake waters. But the important point is that in 25 out of the 30 lakes -- over 80 percent of them -- ANC was lower in late April, after snowmelt, than in early November, when you sampled. Therefore, using the November values paints a picture less severe than the lake biology really endures.

Please describe and explain what correction you will apply to the Eastern lake Survey to represent accurately the acid conditions that may be killing fish in the springtime.

1.(c) Eastern Lakes Survey, (direct/delayed response):

In your prepared remarks at the Dec. 11 hearing, you stressed that the Eastern Lakes Survey has provided only a "snapshot" of the acidity of the lakes. You then said that the direct/delayed response research is planned to determine if there is a point at which the buffering capacity has been overwhelmed.

Senator Hart expressed the concern that the possibility existed that, were the buffering capacity to be overwhelmed, the acidification could proceed rapidly in many lakes at once.

Dr. Kulp responded that,

"[I]n the Northeast, ...the total amount of sulfate precipitation has been within about 20 percent for almost 50 years. It is not rapidly growing, and this would suggest that many of the lakes are at equilibrium or, if they are changing, they will change slowly or only a few at a time. So I think the probability of a catastrophic event is really scientifically quite unlikely. That does not mean in the very long term there would not be change."

Senator Lautenberg asked what "equilibrium" meant, and Dr. Kulp replied that where emissions and precipitation of sulfur have been "fairly uniform for almost 50 years...that one would expect that whatever the status of a particular lake, it is essentially at equilibrium", i.e., it is going to stay non-acid and continue to have fish indefinitely.

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Farther along, Senator Lautenberg again inquired of Dr. Kulp about the state of equilibrium in Eastern lakes, asking how his conclusion could be drawn on only a "snapshot". Dr. Kulp reiterated that he does not expect that the direct delayed response research will indicate that many lakes are at the edge of disequilibrium. When Senator Lautenberg pointed out that in a titration process a constant input can lead to an abrupt change in acidity Dr. Kulp responded: "If the deposition started a year or two ago, you would look for something perhaps that would be quite sharp. The longer the term of the deposition, the slower will be that titration effect."

Scientists review of Dr. Kulp's statement believe he may be in error, on the grounds that the rate of pH change (through the titration point) is a function of the amount of acid input per year versus remaining buffering capacity, and the rate of pH change is not a function of how long the deposition has occurred at some constant rate. Further, they believe that a single "snapshot" cannot justifiably support any conclusion regarding the state of equilibrium.

I would appreciate an assessment and explanation of Dr. Kulp's statements.

2. Ozone and Research:

Please explain the reductions in scientific assessment support for the measurement of ozone and its effects (approximately \$1 million in 1983, down to \$400 thousand in 1984-85 and \$120 thousand in 1986).

3. Forest Damage Research:

Please explain the reasoning behind termination of funding for an established long-term forest damage monitoring program such as existed at Camel's Hump, Vermont. Should not NAPAP's funding decisions take into account: demonstrated interest predating availability of Federal funding; diversity of research (geographical and ecological); independence from Federal agencies; integration of research (e.g., enhancing monitoring with biological research); and long time series measurements in sensitive regions?

4. International Activities:

The Energy Security Act directs NAPAP to cooperate

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with other nations regarding acid deposition research, and the 1984 Annual Report lists a Taskgroup J for that purpose; but the NAPAP budget for this effort has been \$0. Please explain why funding has not been necessary to comply with 42 U.S.C. §8903(b)(11).

5. Materials Damage:

Please explain why materials damage which preliminary reports suggest may total billions of dollars, deserves only 2% of the President's FY 1986 budget request for NAPAP.

6. Visibility:

Is there sufficient information to be able to state that SO₂ emissions are a primary or significant cause of visibility degradation in the Northeastern United States?

What research is being done by the Acid Precipitation Program on visibility degradation that results from emissions of sulfur dioxide?

When will enough be known to set target levels for transformation products of SO₂ at which visibility impairment will be minimized?

7. Target Loadings:

In a briefing paper prepared for former Administrator Ruckelshaus in 1983, EPA staff discussed the concept of target loadings, defining the term as "levels of acidic deposition below which all but the most sensitive resources will be protected". The paper stated that credible terrestrial target loadings could be forthcoming in 1987 if funding were increased from the 1983 levels by \$1 million per year, and that results in aquatic effects research could be available in 1986 with increased funding. The Canadians have established a level of 20 kilograms per hectare as a target deposition level to protect "moderately" sensitive aquatic ecosystems.

Please state whether or not you anticipate that U.S. target loadings as defined will be established in 1986 or 1987. If not, please say when they will be established.

Please state whether or not EPA could develop a control plan to achieve a given deposition target (e.g., 20 kg per hectare). If not, why not?

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8. Policy Recommendations to Congress:

During the December hearing I inquired about the failure of the 1983 and 1984 NAPAP Annual Reports "to contain recommendations to Congress and the appropriate agencies about action to be taken by these bodies to alleviate acid deposition and its effects." These recommendations are required by the Energy Security Act of 1980 (42 USC §8903(b)(14) and (e)).

Mr. Riordan responded by apologizing for the lateness of the annual reports and Dr. Kulp said, of the upcoming assessment:

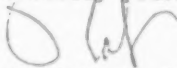
"The 1985 assessment will be essentially a "state-of-science" critically reviewed, and from there the integration of the effects from one of these areas of research to another, so that the total impact of the effects will be considered, the total impact of the emissions will be considered, and such other relationships as we can state at that time."

Please state whether or not your 1985 report will comply with the requirements of 42 USC §8903(b)(14) and (e) by containing policy recommendations for Congress.

Please state who will be drafting these recommendations, and their progress to date.

Thank you in advance for your attention to these questions. I know you have a busy schedule this year. I look forward to the public release of your 1985 reports and assessments.

Sincerely yours,



Robert T. Stafford
Chairman

1.(a) Eastern Lake Survey (EPA Policy):

The "200 plus" lakes discussed in Dr. Goldstein's memo referred to our understanding of the number of lakes known to be acidic, based on data available at the time. In 1983, when EPA conducted an assessment of the state of knowledge of aquatic effects of acid rain, we believed that at least 200 lakes, and perhaps as many as 700, were acidic and may have been affected by acidic deposition. It was thought that perhaps 300 to 500 acidic lakes existed in the Northeast, taken as a whole. These estimates were based on samples known to have sampling deficiencies (for example, inconsistent sampling methods, or inadequate statistical design) that prevented characterization of regional populations; nothing in the scientific literature at the time would have allowed defensible extrapolation. It was this realization that led to the Eastern Lake Survey - Phase I, to provide the first statically-based estimates. Based on the sampling of 771 lakes out of a total target population of 7,206 potentially sensitive lakes in the Northeast (ELS-1 Region I) the Survey (as reported in Dr. Goldstein's memo) showed that our best estimate of the number of lakes at pH 5.0 or below was 261 with a 95 percent upper confidence that the number did not exceed 343. Based on these results, we do not see a need to alter our policy and program.

Of course, the Survey data alone cannot be used to conclude what caused the lakes to be at such a pH level; different research programs are required for such purposes, and several such programs are currently underway.

1.(b) Eastern Lake Survey (Spring Shock):

We believe that correction of the Eastern Lake Survey to represent spring acidification is neither practicable nor desirable, because acidification due to snow melt does not appear to be closely related to average surface water acidity.

The Eastern Lake Survey - Phase I was aimed at providing, as quickly as possible, an estimate with known statistical confidence of average annual conditions in relation to pH, alkalinity, sulfate concentrations, and several other chemical parameters. In the judgement of many scientists, on my staff and elsewhere, the well-mixed conditions in most lakes in the fall provided the best opportunity for such an estimate. Before proceeding to initiate this project, we had the approach thoroughly peer-reviewed inside and outside the Agency. Further examination of other conditions, such as a survey of conditions in the West or of seasonal variations in lake chemistry, were planned as sequential, phased efforts. This was a deliberate decision to permit a timely and efficient collection of the many data required for a clear understanding of current conditions, rates of change, and cause-and-effect relationships in surface water chemistry.

We were well aware that short-term phenomena such as snowmelt require more intensive observation than a single "snapshot" in time. Furthermore, the relationship between acidity and biological response is clearly a dynamic response to rapidly changing conditions that are not well defined by a single observation. These requirements are being addressed by the ELS-Phase II.

The Eastern Lake Survey - Phase II has four objectives that collectively will provide a strong foundation for discussion and decisions regarding the proper interpretation of ELS-I. These four objectives are: (1) to estimate

variability associated with spring sampling; (2) to estimate variability associated with a single fall sample; (3) to estimate variability among seasons; and (4) to provide a statistically sound estimate of current biological conditions in relation to surface water chemistry. An important characteristic of the Phase II sampling will be the maintenance of a close statistical relationship with the ELS-I sampling scheme. Phase II sampling will take place in a statistically chosen subset of the Phase I lakes, thus allowing extrapolation of Phase II results to regional conditions. The focal point for Phase II will be the Northeast (New England, New York, and Pennsylvania).

The spring variability research has developed from earlier observations of snowmelt and storm-related acidification. Because continuous observations are impractical, this research will determine the variability associated with sampling on a periodic schedule. These results will be supplemented with research into the mechanisms associated with spring episodic acidification. This mechanistic research is the focus of the Episodic Research Project, a research effort that will concentrate on changes in snow and surface water chemistry during snowmelt in a small subset of the Direct/Delayed watersheds. The episodic research will also add a similar set of observations on about 20 streams in the southern Appalachian Mountains, and will include nitrogen acidity.

The Phase II research will also allow estimation of the variability associated with the single fall sample taken in Phase I. This estimate, along with an estimate of seasonal variability, will help to define the relationship of the ELS-I fall sampling to the conditions of lakes on an annual and seasonal basis. Together, these estimates will help permit the proper interpretation of ELS-I data, as far as chemical conditions are concerned.

The objective of the remaining portion of the Phase II effort is to form for biological populations a survey more or less comparable to the Phase I survey for water chemistry, relating the biological data collected to the chemical conditions determined during both Phase I and Phase II. This survey will determine, on a regional basis, lakes with and without catchable fish for both warm-water and cold-water species. Furthermore, the research will include characterization of aquatic habitats, to provide the foundation for developing relationships between fish catchability and habitat conditions.

1.(c) Eastern Lakes Survey (Direct/Delayed Response):

I will comment briefly on your questions, and then provide responses by Dr. Kulp on his statements.

We believe that a simple titration model for surface water acidification is an inappropriate model for the behavior of most watersheds. As outlined by a special National Academy of Science panel convened at EPA's request, the rate (and in fact, the direction) of pH change of surface waters is a function of the rate of acid input in relation to sequestration of sulfate input and the net rate of generation of buffering capacity in the watershed, including the surface waters and sediments. These concomitant processes in every watershed produce or consume acidity even as deposition continues, so a static titration model is usually incorrect.

With respect to your second point, that the ELS-I results cannot support any conclusion regarding equilibrium, you are correct to note that the Survey data only show what current conditions were, at one instant. Extrapolation to future or past conditions must either await additional research, such as we are attempting in the Direct/Delayed Research Project, or extrapolation may be a judgement call based on current understanding of watershed dynamics. Dr. Kulp's statement was clearly his judgement, based on current conditions and his understanding of watershed dynamics.

The following is Dr. Kulp's amplification of his statement:

"You have asked me to comment further on my statement to the Committee on Environment and Public Works on December 11, 1985, to the effect that relatively constant acid deposition in the Northeast over the last 50 years has resulted in approximate equilibrium conditions between the surface loadings and lake acidity. This led me to conclude that in the near term an abrupt change in

the pH of a given lake or in a group of lakes is highly improbable.

"The fundamental reason for this conclusion is that for each watershed there are a myriad of hydrologic pathways, each with its own geochemical environment between the ground surface and the lake. The contribution to the total effluent volume from a given pathway will depend primarily on its effective cross-sectional area and its permeability. The chemical composition (including acidity) will depend on the geochemical environment of the pathway. Since this environment consists of many species of minerals with variable surface areas, the rate of neutralization will gradually change. Thus if a short permeable pathway had only a small percentage of a highly reactive mineral, e.g. a thin calcium carbonate coating on less reactive minerals, the effluent from this pathway could become more acid in a relatively short time and might appear abrupt when it occurred. If on the other hand, a longer pathway with lower permeability contained the same carbonate mineral, but it was more evenly distributed in the matrix, and was perhaps accompanied by other neutralizing minerals, the effluent would begin to show higher acidity only after a longer interval. Also in this pathway the acidity in the effluent would increase much more gradually and would stabilize at lower concentrations. A further important consideration is that all pathways are inhomogeneous; therefore, the acidified "front" becomes broadened with time. Finally, the average acidity of the total effluent is the weighted sum of the individual effluents from a large number of different pathways; hence, the time interval over which the acidity changes is much larger than for any single pathway.

"Therefore, it follows that if the average atmospheric deposition is changed on real watersheds, some may show higher acidity in their effluent to streams or lakes almost immediately, (e.g. surface runoff from a granite surface). Others may never change (calcareous soil on limestone bedrock). In between

these extremes is a continuum of response such that, for a constant level of atmospheric deposition, the longer it takes for increased acidity to show up in the effluent, the more gradual will be the increase when it does appear and the lower the new equilibrium level of effluent acidity. Finally, where the travel time in a pathway is long enough so the surface acid loading is equalled by the mineral weathering rate, no significant change in the effluent acidity will occur even over the long term.

"In conclusion, the fact that the annual acidic loading in the northeast has been roughly similar for the last fifty years strongly argues against either a sudden increase of the acidity in any given lake or an abrupt simultaneous change in a group of lakes. Therefore, the impact of current (50 yrs.) acid precipitation has already established a new equilibrium level of acidity in the lakes that have been affected and little change would be expected in them in the near term."

"(The above discussion does not deal with the potential for short term episodic effects from surface runoff.)"

"One other point - The concept of 'titration' as generally conceived, i.e. rapid neutralization of an acid by a base in aqueous solution in a laboratory beaker, has no relevance to watershed phenomena and its use can be clearly misleading."

2. Ozone and Research:

The funding that you inquired about is for the scientific assessment process that contributes to the preparation of a Criteria Document. Because the new Criteria Document for ozone is due in 1986, much of the work was done in previous years, and the funding decrease is to be expected.

3. Forest Damage Research:

This question seems to be based on a misconception. EPA did not terminate funding of a research program on Camel's Hump. Investigators who had proposed work at that site in response to an open solicitation for monitoring to support effects research were not funded. Subsequently, those investigators raised questions about the review process. In response to their concerns, we have committed ourselves to re-examine all proposals that were received under the solicitation. However, at no time has this process led to the termination of EPA funding of scientists who were already receiving Agency funds.

4. International Activities:

NAPAP has a well-developed and extensive group of international cooperative activities. Task Group J was established principally to coordinate this development, not to fund it. During the recent reorganization of NAPAP, the structure and functions of individual Task Groups were re-evaluated. It was decided at that time to coordinate all international activities through the Office of the Director of Research. Therefore, the NAPAP budget does not show a separate line item for an International Activities Task Group.

Bilateral research programs have been negotiated with representatives from Canada and the Federal Republic of Germany, and participation in multi-lateral programs, particularly through programs of the United Nations, has been increased. Perhaps more important to the rapid advancement of appropriate scientific research, individual foreign scientists have taken part in research design, research studies (with an emphasis on comparative evaluations), and research review and program evaluation. This is currently an active international endeavor.

5. Materials Damage:

Unlike the other components of the NAPAP program, which were research activities existing prior to the inception of NAPAP, the materials effects program started from essentially a zero base. Over the last four fiscal years, the materials effects budget has increased to a level of \$1 million. During this period, the major emphasis has been to better characterize the fundamental research methods, and to make some preliminary estimate of the magnitude of the problem. It was the policy of the Task Force not to commit major increases in funding to this program until this initial scoping effort had been carried out. The scoping is nearing completion; a workshop this spring will review the work and propose future directions. A reprogramming of FY 87 funds into this area may result.

6. Visibility:

We feel that enough is known to state that sulfur dioxide emissions are a significant cause of visibility reductions. Based upon a recent survey of studies of regional haze in the eastern states, conducted by EPA and other groups, EPA's Visibility Task Force estimated that sulfates, which were primarily derived from sulfur dioxide, may account for 40% to 80% of regional haze in the East. However, in the six most northeasterly states, visibility tends to be markedly better than elsewhere in the East, and the influence of sulfur dioxide emissions there appears to be episodic in nature.

NAPAP is not conducting research on visibility degradation associated with emissions of sulfur dioxide. However, outside of NAPAP, EPA is conducting a multi-year program to determine the extent and contributing factors associated with visibility degradation in the United States.

The major component of this program is the establishment and operation of two visibility trend networks to quantify the changes in visual air quality over the next five to ten years. One network will have measurement sites located in selected Class I areas, mainly in the western states. The other network will locate measurement sites in selected rural areas in the eastern states. In addition to these visibility trend networks, specific chemical studies will be conducted to determine the role of fine particulates, especially sulfates and organics, in reducing visibility. The visibility program depends heavily upon scientific information obtained from other NAPAP studies, especially those that provide emission inventories and air quality characterization.

Establishing control targets for transformation products requires two related predictions: sulfate concentrations as related to sulfur dioxide

emissions, and visibility impairment as related to sulfate concentration. A reasonably good theoretical and empirical basis exists to show that sulfate concentrations are related to visibility degradation. This is not the case for quantifying the contributions of sulfate compounds and mixtures to visibility impairment, as compared to humidity and non-sulfate fine particulates, which are also well understood to impair visibility. The research program described above is intended to address these uncertainties.

The problem of predicting sulfate concentrations from sulfur dioxide emissions on a regional scale is directly related to the overall regional modeling question we are addressing in the acid deposition program. Improvement in acid deposition modeling will therefore improve our ability to specify which scenarios for emissions reductions minimize the effects of sulfates on visibility in various regions.

Within two to three years, these research efforts should place us in a stronger position to propose target levels for transformation products of SO_2 that impair visibility.

7. Target Loadings:

In 1983, target loadings under discussion were those that might protect all but the most sensitive aquatic ecosystems. ~~Also~~ consider a target loading for terrestrial systems, some evidence for terrestrial damage would be required. Research into the effect of acid rain on forests or crops has not yet met this requirement.

Target loadings require defensible dose-response relationships between input rates and ecosystem responses. Currently, two research efforts underway will lead to such relationships for aquatic ecosystems: the Direct/Delayed Research Project (DDRP), and the Watershed Manipulation Project (WMP).

The DDRP will provide an unvalidated projection of possible regional responses, with as yet unknown accuracy, in 1988. These responses could serve as the basis for setting target loadings. The experimentally manipulated watersheds research will provide much improved estimations of watershed response to changes in loading rates, but these data will not be available until several years of experimentation and comparison with model outputs are available.

Dose-response estimates, whether from the unvalidated projections of DDRP or from the more refined outputs from the experimental watersheds, will be derived from existing models of watershed dynamics. These models are the state-of-the-art approach for prognosis of surface water changes due to acidic inputs. However, they remain unvalidated, simply because of the time required to generate many annual cycles of watershed activity. Furthermore, the overall usefulness of the dose-response projections from these models depends upon their accurate depiction of natural variability over decades. Consequently, estimates of target loadings will unavoidably retain significant levels of uncertainty until the models have been checked against data through many annual cycles.

You asked us to state whether we could develop a control plan, given a deposition target. With the current scientific uncertainty, it is not clear that a single deposition target for the nation or for any specific region can be credibly established. However, even if it was possible to set such targets for a specific region or regions, this in itself would not enable us to responsibly design a control program at this time. We would still lack reasonable confidence in our ability to predict the extent to which that target would be achieved by any particular control strategy. There still remains significant uncertainties with the current state of knowledge of regional atmospheric transport, transformation and deposition processes. We would not know with adequate certainty whether a control strategy was significantly overachieving or underachieving the deposition target.

If we had reason to believe that we were facing an impending ecological emergency in which significant environmental resources might be lost or damaged rapidly, moving forward based on current understanding might be justified. We have not as yet found significant scientific evidence of such an emergency, despite the fact that NAPAP scientists have searched for it and continue to do so. Our understanding of the science indicates that there is time to learn more from our current research programs before making a decision. This should greatly improve our ability to design effective and efficient control program alternatives.

We do not yet have the data to determine if a target loading of 20 kg per hectare, or any other specific level, would provide reasonable protection of sensitive resources in all regions. Once the results of current aquatic

research programs are available, we anticipate the need to establish region-specific targets based on differences in resources at risk, geology, type of vegetation, etc. We do not currently have the data and scientific understanding needed to design these targets.

For all of these reasons we do not believe that a credible and reasonable control program can be designed based on the often cited deposition target of 20 kg per hectare.

8. Recommendations to Congress:

NAPAP Annual reports have provided the Congress with a summary of the status of ongoing acid deposition research under the Energy Security Act of 1980, and an identification of future research activities. In each of the reports to date, no recommendations have been made regarding additional controls which should be instituted to deal with acid deposition. This is because the Administration does not believe that a decision regarding additional controls can reasonably be made at this time, given the important uncertainties in the science. As we discussed in the hearings of December 11, 1985, the decision to proceed with additional controls is not a scientific one. It is a question of social policy and must be based not only upon good science but take into consideration the full spectrum of concerns surrounding this issue. NAPAP's enabling legislation wisely placed the responsibility of making such judgments directly upon the task force members, not on the research or assessment portions of the program. The NAPAP Joint Chairs Council has recognized that the credibility and usefulness of the NAPAP research and assessment program as a source of objective science was dependent upon its not getting entangled in policy judgments. For this reason we included within our memorandum of understanding between NAPAP agencies (attached) a directive that NAPAP's research and scientific assessment activities be "free from direct involvement in policy analysis." Policy support to the Joint Chairs and the Task Force is provided by the policy analytical staffs of the NAPAP agencies. In this way we can insure the integrity of both the science and policy analysis.

The NAPAP Assessment Report is being prepared under the direction of NAPAP's Director of Research, Dr. J. Laurence Kulp. In keeping with the proper separation of science and policy, it is not within the scope of the assessment effort to either address policy questions or to make policy recommendations. Instead the assessment will focus on providing a critical evaluation of the current state of acid rain science.

The Administration's recommendation on the need for additional emission controls has been presented to the Congress on a number of occasions, most recently in my testimony before your Committee on December 11, 1985. Additionally, Administrator Ruckelshaus stated in testimony before your Committee on February 2, 1984, and as I have personally reconfirmed to the Committee: "When the fundamental scientific uncertainties have been reduced, this Administration will craft and support an appropriate set of measures to solve the acid rain problem."

QUESTIONS FOR ADMINISTRATOR LEE M. THOMAS
ACID PRECIPITATION
SENATOR FRANK R. LAUTENBERG

DURING YOUR DECEMBER 11, 1985 TESTIMONY BEFORE THE SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE, YOU STATED THE AGENCY'S POLICY, "...WHEN THE FUNDAMENTAL SCIENTIFIC UNCERTAINTIES HAVE BEEN REDUCED, THIS ADMINISTRATION WILL CRAFT AND SUPPORT AN APPROPRIATE SET OF MEASURES TO SOLVE THE ACID RAIN PROBLEM." I HAVE GRAVE CONCERNS ABOUT THE RAMIFICATIONS OF THIS CONCLUSION. EXPERTS IN THIS COUNTRY, IN CANADA, AND IN EUROPE HAVE COME TO THE CONCLUSION THAT ACID RAIN IS CAUSING SIGNIFICANT ENVIRONMENTAL AND PUBLIC HEALTH DAMAGE, AND THAT STEPS MUST BE TAKEN NOW TO REDUCE POLLUTANTS THAT CONTRIBUTE TO ACID RAIN. EVEN THE PRESIDENT'S PANEL APPOINTED BY THE WHITE HOUSE OFFICE OF SCIENCE AND TECHNOLOGY POLICY CONCLUDED IN 1983 THAT THE RISKS OF WAITING FOR MORE INFORMATION OUTWEIGHED THE RISKS OF ACTING PREMATURELY, AND RECOMMENDED REDUCTIONS IN SULFUR DIOXIDE.

1. WHAT ARE THESE FUNDAMENTAL SCIENTIFIC UNCERTAINTIES THAT PREVENT AGENCY ACTION TO RECOMMEND A PROGRAM TO CONTROL ACID RAIN? AREN'T "SCIENTIFIC UNCERTAINTIES" IMPLICIT IN ALL EPA PROGRAMS? HOW DO YOU EXPLAIN THE INCONSISTENCIES IN THE AGENCY'S POSITION ON ACID RAIN AND OCEAN INCINERATION? EVEN THOUGH THE SCIENCE ADVISORY BOARD RECOMMENDED THAT ADDITIONAL RESEARCH BE CONDUCTED ON THE ENVIRONMENTAL IMPACT OF OCEAN INCINERATION, THE AGENCY CONTINUED DEVELOPING ITS REGULATIONS FOR OCEAN BURNING. WOULDN'T MOVING FORWARD WITH A PROGRAM TO CONTROL ACID RAIN, IN THE FACE OF SOME SCIENTIFIC UNCERTAINTY, BENEFIT THE ENVIRONMENT, WHEREAS MOVING FORWARD WITH A PROGRAM TO INCINERATE HAZARDOUS WASTES AT SEA, GIVEN THE SCIENTIFIC UNCERTAINTIES IDENTIFIED BY SAB, BE ENVIRONMENTALLY RISKY? OTHER NATIONS HAVE BEEN ABLE TO TAKE RESPONSIBLE ACTION. DID THEY WAIT UNTIL THERE WAS "FUNDAMENTAL CERTAINTY"?
2. WHAT STUDIES, BOTH COMPLETED AND ONGOING, HAVE THE AGENCY DEVELOPED TO DETERMINE WHETHER THERE IS A SUBSTANTIAL THREAT TO HUMAN HEALTH FROM EITHER THE DIRECT OR INDIRECT EFFECTS OF ACID RAIN? WHAT ACID RAIN STUDIES ARE PLANNED OR NEEDED TO EVALUATE THE ADVERSE HEALTH EFFECTS AND TO DETERMINE WHAT POPULATIONS ARE AT SPECIAL RISK?
3. WHAT NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM FUNDS ARE CURRENTLY DESIGNATED TO STUDY THE ADVERSE HEALTH EFFECTS OF ACID RAIN? WHAT FUNDS ARE EARMARKED FOR FUTURE HEALTH EFFECTS STUDIES? WHICH OFFICES WILL CARRY OUT THESE NEEDED STUDIES AND WHEN WILL THE RESULTS BE MADE AVAILABLE? HOW DO THESE FUNDS COMPARE TO THE FUNDS DEVOTED TO MODELLING OF LONG-RANGE TRANSPORT AND DEPOSITION?
4. IS THE CURRENT ESTIMATE OF THE MATERIAL DAMAGE BY ACID RAIN IN THE DRAFT STUDY PREPARED BY EPA, BROOKHAVEN NATIONAL LABORATORY AND THE ARMY CORPS OF ENGINEERS, \$3.5 BILLION PER YEAR, ACCURATE? WHY NOT IF NOT? IS THE NUMBER OFF BY \$1 BILLION, \$0.5 BILLION? PLEASE MAKE ALL REVISIONS OF THE REPORT AVAILABLE TO THE COMMITTEE AND PROVIDE THE COMMITTEE WITH A SCHEDULE FOR COMPLETING THE STUDY.
5. THE EXTENSIVE STUDIES BY D.V. BATES OF CANADA INDICATE A RELATIONSHIP BETWEEN HOSPITAL ADMISSIONS DUE TO RESPIRATORY PROBLEMS AND SULFUR DIOXIDE

LEVELS. DURING YOUR TESTIMONY, THESE STUDIES ,E.G., CAN. J. PUB. HLTH, 74: 112 (1983), WERE DESCRIBED AS CONTROVERSIAL. WHAT ARE YOUR SPECIFIC EVALUATIONS OF THIS STUDY? WHAT ADDITIONAL STUDIES NEED TO BE DONE TO COMPLETE THE ESTABLISHMENT OF A RELATIONSHIP BETWEEN RESPIRATORY ILLNESSES AND SULFUR DIOXIDE LEVELS? WHAT STUDIES AT EPA FOCUS ON THIS ISSUES?

1. Scientific Uncertainties:

Briefly, there are indications of possible effects of acid deposition in three basic areas: aquatic resources, forests and materials. There are significant uncertainties in our ability to determine the relationship of acid deposition to these possible effects, or in some cases, to quantify that relationship. In aquatic effects, the principal scientific uncertainties relate to the following questions:

1. How extensive is current damage attributable to acid deposition?
2. What are the anticipated rate and extent of damage in the future?
3. What rates of deposition will provide various levels of protection for sensitive surface waters in various regions of North America?

All of these questions are being addressed by current or planned research through the National Surface Water Survey, the Direct Delayed Response Research Project, and the Watershed Manipulation Project.

We know less in the area of forest effects. We are currently attempting to determine the magnitude of forest damage in this country which may be caused by air pollution, including acid deposition. Future research will attempt to establish the causal relationship, if any, between these air pollutants and damage -- that is, which (if any) of the current hypotheses of air pollutant damage mechanisms is(are) correct? If such a causal relationship or set of relationships can be established, there still remains a need to determine the quantitative dose/response relationships -- that is, what rates of deposition or exposure will provide various levels of protection to sensitive forest resources.

In the materials area, there is considerable uncertainty as yet in the damage functions, which relate levels of exposure to acid deposition and other pollutants to rates of deterioration of specific types of materials. This causes a considerable range of uncertainty about the scope of materials damage currently occurring that can be attributed to acid deposition or its precursors. There is also considerable uncertainty in existing methods for calculating the economic value or consequence of materials damage at various rates of deposition.

Finally, there are still major gaps in our ability to quantitatively relate a given change in the rate and distribution of emissions to an expected change in the distribution, rate and form of deposition. This would affect our ability to design an effective control program, even if we knew what levels of deposition were required to protect sensitive resources.

We recognize that there will always be uncertainties in these complex scientific areas and we do not require certainty in order to act. We believe that the current uncertainties, however, are so large as to make policy design largely a matter of guesswork. We fully expect that the research programs currently in place to address these uncertainties will provide results over the next few years which will greatly improve our ability to design a control program. Our decision is to wait for some of these results and then to develop a reasonable response to the problem.

I do not believe there is any inconsistency between Agency decisions on acid rain control and ocean incineration. In both cases we have applied principles of risk assessment and risk management, which Bill Ruckelshaus established for the Agency and which I whole-heartedly support. Risk assessment is the use of a base of scientific research to define the probability of harm coming to an individual, population, or environmental resource as a result of exposure to a substance or situation. Risk management, in contrast, is the public process of

deciding what to do where risk has been determined to exist. It includes integrating risk assessment with considerations of engineering feasibility, and balancing our imperative to reduce risk with relevant social, economic and political factors.

We believe it is extremely important to maintain the distinction between risk assessment and risk management. We have attempted to draw on the best available scientific judgment in all areas in the risk assessment process. When scientists make recommendations on specific policy actions, however, they move into the arena of risk management. Risk management decisions require the combination of science, economics, law, and social policy in making a decision. To make a decision only from the perspective of science is as inappropriate as to make a decision only taking economics into consideration. In my role as Administrator, I have listened carefully to recommendations of the scientific community, but do not feel bound to follow their policy recommendations. In the two areas you mentioned, we have carefully assessed the risks and then made a difficult decision on our course of action. I believe that these were both fundamentally sound decisions based on the relevant factors in each specific situation.

Several other nations have recently announced acid deposition control programs, principally reductions in emissions of sulfur dioxide (SO_2) and in some cases nitrogen oxides (NO_x). The European countries involved generally have lagged behind the U.S. in the clean-up of air pollutants. As a result, these countries currently have greater emissions densities and poorer air quality than does the U.S. In their situations, it is entirely appropriate to take rapid action to reduce emissions, as was the case in the U.S. in the early 1970's. This country has made great progress over the past fifteen years in reducing air pollution. We have reached the point at which additional, and

increasingly costly, reductions must be carefully weighed against the expected benefits prior to action. We are currently developing a scientific basis for such balancing.

The Canadian government has recently announced an acid rain control program the implementation of which will bring their emissions of SO_2 down over the next ten years even more sharply than has been done historically in this country. Undoubtedly, Canadian decision-makers have weighed the current scientific uncertainties and considered the political, economic, regional equity, and other factors which pertain to their own particular situation in making their decision. Those factors are considerably different in this country, and after considering all relevant issues we do not recommend rapid additional control in the face of large technical uncertainties.

2. Human Health Effects

The effects of acidic deposition on health could potentially arise from inhalation of a toxic material (a direct effect on health) or from ingestion. Ingestion of the components of acidic deposition does not induce toxicity, but the deposited substances may result in increased exposure to other toxic substances in either drinking water or food (thus an indirect effect on health). Under the Clean Air Act, the Agency has been directed to protect public health from harmful effects of air pollutants, and currently, six criteria pollutants, including sulfur dioxide and nitrogen oxides, have been regulated. In the process, questions arose about the welfare (i.e., non-health) effects of these components of acidic deposition, leading to the establishment of acidic deposition assessment and NAPAP. In response to a recommendation of the Clean Air Science Advisory Committee, stemming from a recent Criteria review, EPA is setting a schedule for evaluation of the effects of acidic aerosols.

NAPAP has not revised or attempted to expand the well-established work on direct effects on health, but has directed its resources to understanding indirect effects. Therefore, the Agency has funded NAPAP to do indirect health effects studies, including:

- ° a public water supply survey of the Northeast, performed by the New England Water Works Association, which sampled both surface and ground-water supplies: the study did not find strong evidence of contamination;
- ° an ongoing study of drinking water quality in cisterns, which is co-funded by the Tennessee Valley Authority;
- ° an ongoing modeling project of trace metal speciation in acidic waters;
- ° an ongoing study of baseline bioaccumulation of mercury in fish, which is co-funded by the Fish and Wildlife Service.

A correlation between low pH and bioaccumulation of mercury in fish has been demonstrated, but the actual cause of bioaccumulation is unknown, and the

geographic extent of the phenomenon is unknown. Since the state-of-the-art for mercury detection in the water and in the sediments is inadequate, EPA is unable to incorporate the measurement of mercury into its National Surface Water Survey. Canadian researchers have been compiling an extensive data base concerning mercury in fish, but for it to be helpful in the definition and solution of this problem, measurement of mercury in the water and sediments, as well as methylation rates, would be necessary. These are fundamental research problems which need to be addressed more fully.

The population at risk through drinking water effects of acidic deposition is not known. However, evidence to date indicates that the potential risk is small. The next section addresses the NAPAP efforts in this area.

3. NAPAP Funding of Health Effects Research

The National Acid Precipitation Program is only addressing the possibility of indirect health effects from acid deposition. The scientists of NAPAP believe that the major concern over indirect human health effects of acidic deposition is focused on metal accumulation through drinking water and consumption of fish with elevated concentrations of metals. As mentioned in the answer to the previous question, it has been proposed that the primary effects of acidic deposition on drinking water supplies would be through increases in metal concentrations from: (1) the watershed, in the instance of reservoirs or groundwaters; (2) direct deposition of metals into these supplies; and/or (3) the metal pipes transporting water to the tap. The pathways for the bioaccumulation of metals in fish may include one or more of the following mechanisms: (1) mobilization of metals from the watershed; (2) direct deposition of metals in lakes; or (3) increased availability of existing metal concentrations at low pH.

There are three sources of drinking water: (1) surface supplies such as reservoirs; (2) groundwater from wells; and (3) rainwater collected in cisterns. There has been no defensible evidence of groundwater acidification in the U.S. Although there are acidic groundwaters, a link to acidic deposition cannot be made.

Cisterns are now being studied in the current NAPAP program. However, the basic issue reduces to one of deposition chemistry (being extensively studied throughout the U.S.), with a metals corrosivity component (which will be studied in the Materials Damage Program). Because toxic metal concentrations have been defined for human health in the Office of Water, potential health effects of acidic deposition can be inferred from the deposition chemistry and corrosivity information being obtained (making some assumptions relative to population

exposure). However, it is also important to note that relative to cisterns, corrosion is unavoidable when untreated rainwater (whether acidic or not) comes in contact with the collection and distribution pipes or conduits. Soft waters (regardless of acidity) are corrosive, so reduction in acidity of rainwaters will not completely resolve the problem. It is also worth noting that in the recent TVA study of cistern waters, the corrosion of masonry-type collection systems produced chemicals that neutralize the incoming acidity and may thereby reduce metal corrosion.

Reservoirs are the other major source of drinking water. These reservoirs and the streams that flow into them represent a significant portion of the total surface waters studied, not all of which are drinking water supplies. Although not all reservoirs are drinking supply sources, they do provide some indication of the importance of these surface water sources to drinking water. For example, it is estimated that 17 percent of the northeastern lakes studied in the Eastern Lake Survey - Phase I (ELS-I) were reservoirs (3 percent in Maine, 42 percent in the Poconos, 8 percent in the Adirondacks, 5 percent in central New England, and 29 percent in southern New England). An estimated 90 percent of the lakes in the Southern Blue Ridge, and 2 percent in the upper Midwest were reservoirs. In total, approximately 1630 reservoir systems in the areas studied are represented in the ELS-I through sampling and subsequent population estimates. Streams flowing into reservoirs will be studied in the Middle Atlantic Region in FY 86 as part of the Eastern Stream Survey.

The ELS-I split each lake sample to obtain a sample for metal analysis. These first-level screening data can be used to identify areas of the U.S. where metals might be of concern, regardless of the source of the metals. This study is designed only to highlight obviously serious metal contamination problems. As with the cisterns waters, the issue reduces to one of surface

water chemistry, deposition chemistry, and effect on corrosion. The materials damage indices, coupled with the surface water chemical data, can address potential human health effects.

In conclusion, the Deposition Monitoring Program, the Materials Damage Program and the Aquatics Program have collected data relevant to addressing human health issues. In addition, both the Aquatics and Terrestrial Programs assess metal mobility in the watersheds. Work in all these areas is expected to continue over the next five years at a minimum, with EPA and its laboratories being the principal offices to carry out these studies. Because the indirect human health related data are an integral part of the overall NAPAP program, apportioning the funds contributed from each program area for such studies can not be done accurately. We feel that the effort is receiving attention comparable to that being devoted to other receptor areas and to the modeling of long-range transport and deposition. As NAPAP does its future assessments, it will capitalize on the all of the above-mentioned activities to draw those conclusions about current and potential health effects which are scientifically defensible.

4. Materials Damage Estimates:

An initial draft of the Materials chapter of the NAPAP 1985 Assessment contained an estimate of materials damage on the order of \$3.5 billion. These preliminary figures were reported in the media, leading to a large number of public inquiries about the study. As a result, we decided to make copies of the draft available to the public, with the disclaimer that the document had not yet been reviewed. The subsequent peer review revealed that the damage function for paint used in this study was based on data -- collected prior to NAPAP formation -- that were "insufficient to support a reliable estimate of a damage function." This finding by the peer review panel invalidated the economic estimates of paint damage in the draft report. Because paint damage appears to dominate the overall estimates of damage to materials, it is not possible to make an accurate statement of costs at this time. Copies of the revised draft will be made available to the Committee when the draft has passed peer review. Research now underway in NAPAP is expected to yield reliable estimates of damage by 1990.

5. The Bates Report:

EPA has been following closely the continuing studies of Dr. Bates and his co-workers concerning relations between hospital admissions and air pollution in Southern Ontario, Canada. Bates' large scale study has expanded and evolved over many years. The specific paper mentioned in your question (Bates and Sizto, Can. J. Pub. Health, 74:117-122, 1983) reports results for 1974, 1976, and 1978. A more recent paper, now in press, provides additional analyses for 1982, as well as for the earlier years, and the Agency is starting to evaluate the latest findings reported as part of a recently initiated draft Addendum to the 1982 Particulate Matter/Sulfur Oxides Criteria Document. It is therefore premature to communicate any definitive evaluation of either the earlier paper or the more recent findings until the latest paper is published.

Dr. Bates' study is part of a growing body of recent literature on the effects of particles, sulfates, and acid aerosols. The Clean Air Scientific Advisory Committee (CASAC) recommended that EPA staff prepare an addendum to the Particulate Matter and Sulfur Oxides Criteria Document, and an issue paper, evaluating a host of scientific issues pertaining to the health effects of acid aerosols. The EPA Administrator has informed CASAC of his acceptance of this recommendation. The Agency plans to have the addendum and issue paper (which will contain more definitive evaluations of the most recent studies of Bates and co-workers) ready for CASAC review later this year.

The basic question with respect to SO_2 is at what levels of exposure the effects occur in hypersensitive individuals and other subpopulations, and what are the effects of intermittent peak exposure of SO_2 . As part of the overall evaluation now underway with respect to SO_2 , sulfates and particles, we are considering other SO_2 studies to fill this knowledge gap.

Of greater concern are the possible effects of acid aerosols, alone and in

combination with ozone, which are needed to complete the establishment of a relationship between SO_2 and respiratory illness.

The following studies are presently either near completion or will be initiated soon:

- a. Effects of SO_2 on Respiration in Guinea Pigs that Exhibit Hypersensitive Airways.
- b. SO_2 Uptake in Awake Guinea Pigs and Rats
- c. Cardiopulmonary Function in Awake Guinea Pigs and Rats Exposed to SO_2 and SO_2 Combined with Other Airborne Chemicals
- d. Bronchoconstriction in Asthmatics Exposed to Sulfur Dioxide During Repeated Exercise
- e. Differing Response of Asthmatics to SO_2 Exposure with Continuous and Intermittent Exercise
- f. Airway Sensitivity of Asthmatics to SO_2
- g. Pulmonary Function and Symptoms in Asthmatic Subjects Exercising Briefly in 1 ppm SO_2
- h. Pulmonary Function and Symptoms in Asthmatic Performing Exercise While Exposed to Combined SO_2 and H_2SO_4
- i. Influence of Naturally Acquired Respiratory Infections on the Response to SO_2
- j. Pulmonary Functions and Symptoms in Asthmatic Volunteers Exercising in SO_2 and H_2SO_4
- k. The Combined Effects of Respiratory Heat Loss and SO_2 Exposure Upon the Pulmonary Function of Exercising Asthmatics
- l. The Effects of O_3 and H_2SO_4 Aerosol on Moderately Severe Asthmatics
- m. Summer Camp Studies of Lung Function in Relation to Summer Haze (Acid Sulfates and Ozone) 1984 - Indiana and Pennsylvania, 1985 - New Jersey, 1986 - with D.V. Bates and NYU
- n. Reanalysis of London Mortality Data in Terms of H_2SO_4 Episodes (NYU and Harvard)
- o. Analysis of Data from a Netherlands Long-Term Monitoring Study of the Effect of SO_2 and Particulates

- p. Summer Camp Studies of Daily Pulmonary Functions with Sulfate Monitoring from Michigan and Toronto (Toronto, Canada)
- q. Summer Daily Acid Aerosol Monitoring in Kingston-Harriman, Tennessee; St. Louis, Missouri; and Steubenville, Ohio (plus sulfates)

EPA has agreed to collaborate with Dr. Bates when he attempts to repeat his most recent study this summer. New York University and the Canadian Ministry of the Environment will endeavor to improve the monitoring aspect of the study to clarify results. The Agency agrees that additional studies are needed to increase our understanding of the relationship between respiratory illness and sulfur dioxide. This research program when completed should provide enough information to establish the relationship between respiratory illness and sulfur dioxide. The program is designed to respond to the needs of the Office of Air Quality Planning and Standards in establishing standards for the protection of human health.

ATTACHMENT

MEMORANDUM OF UNDERSTANDING

Among Federal Agencies
of the
Joint Chairs Council
of the

National Acid Precipitation Assessment Program
(NAPAP)

Purpose

This agreement amends and replaces the Memorandum of Understanding dated July 16, 1984, to enhance the effectiveness of the National Acid Precipitation Assessment Program (NAPAP). Under the mandate of the Acid Precipitation Act of 1980 (P.L. 96-294), the members of the Acid Precipitation Task Force, share a mutual statutory commitment to develop new knowledge and technology for understanding, predicting and controlling or mitigating effects of regional air pollution derived from the primary precursors SO_2 , NO_x and VOC (phenomena commonly characterized as "acid precipitation"). This Memorandum of Understanding facilitates the coordination of a research and development program to ensure more efficient use of resources and accelerate scientific advances. Nothing in this agreement alters the statutory authorities of the participating agencies.

Organization and Authority

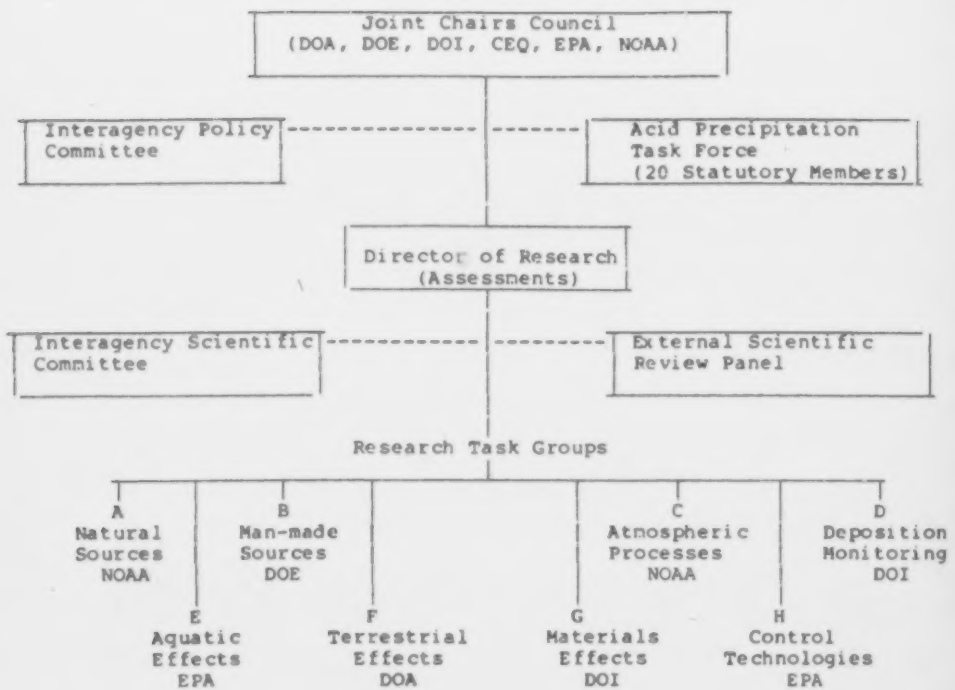
The signing agencies agree to the organizational structure described below and shown in the attached Figure 1 with authority and responsibility as follows:

1. Joint Chairs Council

The Joint Chairs Council (the "Council") consists of the principals from Department of Agriculture (DOA), Department of Energy (DOE), Department of the Interior (DOI), Council on Environmental Quality (CEQ), Environmental Protection Agency (EPA), and the National Oceanic and Atmospheric Administration (NOAA). The Council will provide overall priorities and direction for NAPAP and oversee its implementation, with the advice and recommendations of the Acid Precipitation Task Force. The Council will approve the NAPAP annual research program, the corresponding portions of the annual budgets of the participating agencies, and the overall organization of NAPAP. It will address major NAPAP policy issues including those which concern relationships of NAPAP with the agencies and outside organizations. It will meet at least quarterly. The Director of Research will provide administrative support to the Council.

Figure 1

National Acid Precipitation Assessment Program
(NAPAP)



2. Acid Precipitation Task Force

The Task Force consists of the principals from the Department of Agriculture (DOA), Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), Department of Interior (DOI), Department of Health and Human Services (HHS), Department of Commerce (DOC), Department of Energy (DOE), Department of State (DOS), National Aeronautics and Space Administration (NASA), Council on Environmental Quality (CEQ), National Science Foundation (NSF), Tennessee Valley Authority (TVA), Directors of Argonne National Laboratory (ANL), Brookhaven National Laboratory (BNL), Oak Ridge National Laboratory (ORNL), and Pacific Northwest National Laboratory (PNNL) and four members appointed by the President. The Task Force will meet at least biannually to review the annual research program, budget and assessment activities of the NAPAP and provide advice and recommendations to the Council.

3. Director of Research

The Director of Research is appointed by NOAA with the concurrence of the Council. The Director will formulate, with the assistance of the Interagency Scientific Committee, the annual research program and budget of NAPAP for submission to the Council, guide the implementation of the approved program by the respective Task Group Leaders and agencies, administer the acidic deposition assessment activities of the program, provide periodic reports to the Council. The Director shall ensure the NAPAP research and scientific assessment activities are responsive to the information needs of policy development, but free from direct involvement in policy analysis, including control strategies evaluation. The Director is chief scientist and principal spokesperson for NAPAP. The Director will be assisted in these responsibilities by the staff of the Office of the Director of Research, the Interagency Scientific Committee, and the External Scientific Review Panel.

4. The Interagency Scientific Committee

The Interagency Scientific Committee consists of senior technical executives from the following agencies appointed by their respective principals: DOA, DOE, DOI, DOS, EPA and NOAA. It is chaired by the Director of Research and staffed by the Office of the Director of Research. The Committee will participate in the formulation of each annual program and budget and offer advice to the Director prior to final review, modification and submission to the Council. The Committee will meet at least quarterly to review the implementation of the approved program. Committee members will assist the Director in resolving any operational conflicts involving their respective agencies.

5. The Interagency Policy Committee

The Interagency Policy Committee consists of senior policy executives from the DOA, DOE, DOI, DOS, CEQ, EPA, and NOAA

appointed by their respective principals; the Director of Research is an ex officio member. It is chaired by EPA and staffed by the Office of the Director of Research. The Committee will meet at least quarterly to review the activities of the NAPAP and provide advice and recommendations to the Council concerning the program.

6. External Scientific Review Panel

The Director is authorized to use the National Academy of Sciences to review scientific questions related to the NAPAP as requested by the Council.

7. The Office of the Director of Research

The staff of the Office of the Director of Research consists of a deputy, well-qualified scientists, an office administrator and necessary clerical/secretarial staff. A plan for office activities, funding and staffing will be presented by the Director each fiscal year for approval by the Council.

8. The Research Task Groups

Each Task Group will be responsible for overseeing the implementation of its designated portion of the annual program. Each group will be headed by a senior scientist appointed by the lead agency with the concurrence of the Director of Research. Each Task Group Leader will provide to the Director a written research plan describing the specific tasks proposed, budget details and schedules or anticipated outputs. Task Group Leaders will identify the individual who is responsible for each group activity. For integrated projects that involve responsibilities of more than one Task Group, the Director, with advice of the appropriate members of the Interagency Scientific Committee, will assist the Task Group Leaders in developing a research plan. Subject to modification by the Council, these Task Groups and the lead agencies are as follows:

<u>Task Group</u>	<u>Department/Agency</u>
A. Natural Sources	NOAA
B. Man-Made Sources	DUE
C. Atmospheric Processes	NOAA
D. Deposition Monitoring	DOI
E. Aquatic Effects	EPA
F. Terrestrial Effects	DUA
G. Materials Effects	DOI
H. Control Technologies	EPA

General Provisions

The following program management functions are agreed to by all parties:

1. The agencies shall work through the Council to develop an interagency budget for the NAPAP. The annual research program and budget will be developed by the Director of Research with the assistance of the Interagency Scientific Committee. The Director will submit the proposed budget to the Council for approval. Changes in an approved program may be proposed by the Task Group Leader or the Interagency Scientific Committee to the Director; major changes must be approved by the Council. Task Group Leaders will provide the Director copies of any budget accountings prepared for the lead agency or the Office of Management and Budget.
2. Each agency will ensure that it allocates adequate planning, management and technical staff to execute its portion of the annual program.
3. The agencies will support the Office of the Director of Research as the focal point of the NAPAP. Funding of the Office will be shared by the Council agencies. Each agencies' funding commitment to the office will be in proportion to its share of the current fiscal year's NAPAP budget.
4. Nothing herein shall be construed as modifying or as authorizing the modification of any provision of an appropriation Act (or any other provision of law relating to the use of appropriated funds) which specifies (A) the department or agency to which funds are appropriated, or (B) the obligations of such department or agency with respect to the use of such funds.
5. Nothing herein shall be construed as modifying, or as authorizing the modification of any provision of law (relating to or involving a department or agency) which specifies (A) procurement practices for the selection, award, or management of contracts or grants by such department or agency, or (B) program activities, limitations, obligations, or responsibilities of such department or agency.
6. Nothing contained herein shall be construed as affecting any other cooperative arrangements existing or entered into by any of the parties.
7. This Memorandum of Understanding may be amended, supplemented or extended when agreed to by all parties.

3. This Memorandum of Understanding becomes effective on the date of signature of all parties.

DOA	<u>[Signature]</u>	Date	<u>4/23/85</u>
DOE	<u>[Signature]</u>	Date	<u>9/29/85</u>
DOI	<u>[Signature]</u>	Date	<u>10/8/85</u>
CEQ	<u>[Signature]</u>	Date	<u>10/10/85</u>
EPA	<u>[Signature]</u>	Date	<u>9/18/85</u>
NOAA	<u>[Signature]</u>	Date	<u>9/17/85</u>

ACE**Alliance for Clean Energy**

1901 N. Ft. Myer Drive, Twelfth Floor
Rosslyn, Virginia 22209
(703) 841-1781

December 3, 1985

Mr. Curtis Moore
Counsel
Senate Committee on Environment
and Public Works
410 Dirksen Senate Office Building
Washington, D.C. 20510

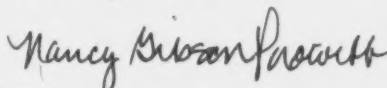
Dear Curtis:

As the December 11 hearings before the Senate Environment and Public Works Committee on the National Acid Precipitation Assessment Program draw near, we thought that you would be interested in the enclosed pamphlet, "On the Record".

This pamphlet documents support for a "free choice/polluter pays" position towards acid rain control legislation adopted by various civic leaders, newspapers, and legislators across the nation. The Alliance for Clean Energy (ACE) is a coalition of low sulfur coal producers, users and transporters, formed due to pending federal acid rain legislation. We hope to be able to testify when further hearings are held on acid rain next year.

We hope you find this material of interest, and as acid rain legislation moves forward in Congress we look forward to working with you. If you have any questions please do not hesitate to call the office.

Sincerely yours,



Nancy Gibson Prowitt

On the Record Acid Rain Legislation

**Public Support for the "free choice" policy
to acid rain control legislation**

Acid Rain Control: What will it cost and who should pay the bill?

Congress may soon choose a program to clean up acid rain. While scientific evidence is not conclusive, they're considering two approaches to reduce sulfur dioxide (SO₂) which is thought to cause acid rain.

The first is called *freedom of choice*. It allows states and local utility engineers freedom to choose the SO₂ control method best suited to their own local circumstances. It also controls clean up costs.

The other approach requires most utilities to install expensive, often unreliable "scrubbers"—giant towers that spray chemicals into the smokestack to remove SO₂. This approach is known as *forced scrubbing*. It wastes billions of dollars, subsidizes plants that cause pollution and penalizes consumers across the country.

The choice before Congress should be easy. But those who advocate forced scrubbing are politically powerful so it isn't.

Although the freedom of choice approach is about half as expensive as forced scrubbing, any program will carry a hefty price tag. So Congress is now asking: "Who should pay the bill?"

The Press

NEW YORK TIMES, September 3, 1983

"A better approach [to control the acid rain problem] is to order a cut in sulfur dioxide emissions and let utilities decide how to attain it. The Waxman-Sikorski tax might sweeten the pill. But curing acid rain will be expensive enough without Congress adding to the price."

THE WASHINGTON POST, August 12, 1983

"Should consumers' electricity bills be raised to distort the coal business in favor of eastern mines? The rule for EPA to propose, and Congress to adopt, is a sharp reduction in power plants' emissions but one that leaves it up to each company to figure out the best and most efficient way to achieve it."

DETROIT FREE PRESS, (Michigan), December 12, 1983

"We'd rather see a state-by-state pay-your-own-way approach to acid rain controls, and think it is in the interest of business in Michigan to lobby Congress for such a solution. The state delegation certainly ought to see that Michigan gets credit in any federally mandated reductions for progress already made. And any acid rain legislation should be flexible on the means of cleanup, allowing utilities to choose how to reduce emissions, whether by burning low-sulfur coal or other means."

COURIER JOURNAL, (Louisville, Kentucky), June 26, 1984

"The Tennessee Valley Authority has shown that utilities, if given a chance to exert their own ingenuity in cleaning the air, can get results without arbitrary requirements for costly new equipment. Such a course offers the best prospects of getting significant results on sulfur dioxide soon."

HOUSTON CHRONICLE, April 24, 1984

"There is a middle ground, fortunately. There are bills requiring those who pollute to pay for cleaning up the pollution. These bills establish a schedule for clean up, setting goals and requiring that they be met without dictating the exact method. The principle that the guy who makes the mess should be the guy that cleans it up is one that seems eminently sensible."

**SAN JOSE MERCURY NEWS,
(California), August 27, 1984**

"We favor a bill like that sponsored by Representatives Dick Cheney, R-Wyo., and Morris Udall, D-Ariz., which would set limits on sulfur emissions, and then allow states and industries to choose the least expensive method of meeting those standards."

**THE REGISTER-GUARD, (Eugene, OR),
April 17, 1984**

"Pollution caused by coal burning plants east of Mississippi must be better controlled. However, mandating installation of sulfur dioxide controls might be less cost-effective than requiring conversion to other fuels, or processing to remove sulfur from coal before it is burned."

**THE PRESS, (Sheridan, Wyoming),
June 26, 1984**

"The *Sheridan Press* early on supported the Cheney bill. Our main reason is because it appears to be for the utility user and because it gives utilities the freedom to utilize whatever technology they feel fits their particular situation. At the same time the measure would bring the acid rain problem under control."

**THE ARIZONA DAILY STAR, (Tucson,
Arizona), February 26, 1984**

"Requiring the Western states to also pay for Eastern cleanup is unfair and adds to the West's own pollution burden. Were the West the region to be adversely affected by acid rain, it is not likely that Midwesterners and Northeasterners would be rushing to pay for its cleanup. A coast to coast tax on electricity is unfair and regressive."

**ST. PAUL PIONEER PRESS (Minnesota)
July 5th, 1984**

"Utilities should be free to choose their own methods of meeting emission reduction standards. Scrubbers may not be the best and most economical answer in each case. (For instance, rapid developments in combustion technology promise to enable utilities to cleanly and cheaply burn high-sulfur coal.)"

**SALT LAKE TRIBUNE, (Utah),
February 14, 1984**

"Westerners, because they have already made a significant and costly commitment to clean up and keep clean

their own air are justifiably unwilling to shoulder the cost of similar control efforts in areas that have been deliberately dragging their feet. Any congressionally derived formula for cleaning up the nation's acid rain must assign the greatest share of the cost to areas where utilities have irresponsibly failed to match the environmentally sensitive efforts of their western counterparts."

**THE TAMPA TRIBUNE, (Florida),
June 19, 1985**

"...the Udall-Cheney bill allows industries to choose the most efficient, cost effective means of reducing their sulfur dioxide emissions. This less burdensome approach may be more acceptable to industries, which have resisted the hugely expensive scrubbers. The Udall-Cheney bill probably does not go far enough...but at least it moves Congress onto a battlefield, a goal that, given Washington's past timidity on the issue, warrants support."

**RICHMOND TIMES DISPATCH,
(Virginia), March 2, 1984**

"Residents of states like Virginia who have already been paying more of their wages in higher utility bills to keep emissions down would, moreover, bear a double burden. Not only will they pay for further reductions in their states' emissions to more stringent and, it is hoped, healthful levels. They will also pay to bring about great reductions in those Midwestern states whose utilities, in the words of a former EPA regional administrator, "got away with such things as installing stacks 1,000 feet high. They took the dilution approach to pollution." They, Reps. Waxman and Sikorski, are now taking the dilution approach to the acid rain solution. Most Americans, given their druthers, want acid rain stopped, if only on the assumption that natural and human resources are better off without it. You can't watch exposure to sulfur dioxide pit the paint on your car, a Virginia coal company chairman told us, and not wonder at its potential for harm. You can certainly wonder why dealing with sulfur dioxide emissions and acid rain must cost billions more than necessary. What most needs scrubbing is that bill."

**BALTIMORE SUN, (Maryland),
April 26, 1984**

"The nation shouldn't be locked into a single technology, scrubbers, if cheaper, more effective alternatives exist."

BECKLEY POST HERALD, (West Virginia), December 16, 1983

"From our point of view, it is imperative for Congress to select the "free-choice" option when action is taken. A requirement for scrubbers would eliminate a market for low-sulfur coal as the cheapest, quickest and easiest way to meet standards for reduced acid causing emissions."

MYRTLE BEACH CAPITAL, (South Carolina), October 21, 1984

"We all want to prevent South Carolina from suffering environmental damage but, when it comes time to vote, our legislators need to examine acid rain proposals carefully to make sure this state's citizens don't end up footing the bill for other states' pollution."

THE MILWAUKEE JOURNAL, (Wisconsin), April 8, 1984

"But what could be fairer? Why shouldn't the users of the electric power have to pay for the full cost of the energy? Surely it is not fair to pass a portion of that cost along to non-users in the form of acid rain damage."

LEXINGTON HERALD LEADER, (KENTUCKY) September 1, 1983

"The Alliance for Clean Energy, the umbrella group representing the western coal producers, estimates that if plants were allowed to switch from high-sulfur to low sulfur coal, Eastern Kentucky and low-sulfur coal mines would gain five times as many jobs as would be lost in Western Kentucky, where the coal is high in sulfur content. The reality is that acid-rain legislation is coming, and probably soon. The low sulfur producers' break with the rest of the industry is a recognition of the fact that coal—from Kentucky or any other state—must be compatible with clean air to compete in the marketplace."

THE GAZETTE, (Cedar Rapids, Iowa), February 4, 1984

"If Iowa-mined coal no longer can be burned in Iowa because its sulfur output is too high to meet federal standards against air pollution, undeniably some Iowans will hurt. Dirtying the air with half again the coal-pollutant volume tolerated for most other states is not a right that Iowa can fairly claim."

**ROCKY MOUNTAIN NEWS, (Denver,
CO), April 22, 1984**

"The best bill yet (Cheney-Udall) on acid rain has been introduced in Congress... The bill is best not for what it does, which is of course to further clean up coal fired emissions. Rather, the bill's virtues reside in its fidelity to two principles that ought to underlie all environmental legislation—namely, those who pollute should pay, and cleanup should not occur at the price of innovation. Environmental legislation ought to do more than protect us. It ought to protect us efficiently."

**CHARLESTON EVENING POST (South
Carolina), October 23, 1984**

"Cleaning up emissions make acid rain an economic as well as a political problem. The fairest legislation will be the measure which allows the utilities a freedom of choice, which permits them to install scrubbers (which are costly), or to convert from high-sulfur to low-sulfur coal. If approximate results can be achieved in either of two ways, the ratepayers will fare far better if the utilities are allowed to opt for the least expensive method."

**WESTERN BUSINESS JOURNAL,
September, 1984**

"It (Cheney-Udall) calls for freedom of choice in allowing utilities to decide how best to reduce emissions, but it puts the cost burden squarely on the sources of the pollution. Acid deposition is a real problem. The Cheney-Udall bill is a real solution that makes sense."

**THE MISSOULIAN, (Montana),
May 16, 1984**

"Meeting a clean-air goal might mean switching to low sulfur coal. It might mean installing scrubbers. It might mean using a new technology to clean out sulfur dioxide. It's cheapest to let the utilities decide for themselves. All Americans should help douse acid rain. It's a national problem. But the cleanup must be not only effective, but fair."

**THE CLEARWATER SUN, (Florida),
March 22, 1985**

"... the Alliance for Clean Energy and others ask why should we spend all that money when we aren't sure if we know the cause of the problem? Obviously many questions need to be answered before any course is chosen. Then a much more enlightened decision can be made."

Governors

Western Governors Association, May 23, 1984

"Congress should adopt an acid rain control program which

1. encourages the most cost-effective emission reductions;
2. relies primarily on states to implement emission reductions;
3. does not impose nationwide costs while providing only regional benefits;
4. recognizes regional differences in size and type of emissions, climate and topography; and
5. minimizes emissions from new sources through the application of Best Available Control Technology."

Governor Richard Riley's (D-S.C.) Recommendation to the State Legislature, December 10, 1984

"South Carolina should support an effective national acid rain control program. It should provide flexibility to the states in the design of their individual control strategies, and should not unfairly penalize those states and industries that are not contributing to the problem."

Governor Chuck Robb (D-VA), November 23, 1983

"Legislation requiring the use of scrubbers will increase the capital costs of compliance by nearly \$20 billion by 1995 without achieving an environmental benefit greater than that which is attainable if a choice of compliance alternatives is allowed. What it will do is impose a national utility tax on almost all Americans for the benefit of the citizens of a few states which have not moved as forcefully to preserve clean air as have we in Virginia. The result will be to subsidize the high sulfur coal industry in the very same states which will also benefit by a utility tax paid by all of us."

**National Governors' Association,
March 30, 1984**

"The National Governors' Association favors a control program that provides flexibility to the states in the design of their individual control strategies."

**Governor Jim Blanchard, (D-MI),
November 10, 1983**

"... The State should be credited for its significant efforts to date in reducing sulfur dioxide emissions and should not be obliged to pay for reductions in other states as part of a national cleanup strategy. A low sulfur coal strategy for reduction of acid deposition is a reasonable one."

**Governor John Sununu (R-NH),
December, 1984**

"Acid rain is an exceedingly complex issue, both politically and scientifically, and the tendency is to look for complex solutions as well. This is a mistake we have often made during the 15 years in which we have been writing environmental legislation. We should be wary of embarking on a massive new program when a simple approach, relying on existing mechanisms, might be more effective, predictable and expeditious."

**Governor Ted Schwinden (D-MT), Before
the Senate Environment and Public
Works Committee, February 7, 1984**

"... The Federal Government should leave to the states and the private economy the job of sorting out the equities of that sulfur dioxide reduction. State legislatures that wish to adopt market protection legislation for higher sulfur coal may do so. Those states that wish to grant their electricity consumers the benefits of pollution control at lowest cost through low sulfur coal may do so as well."

Federal Legislators

**Senator Alan K. Simpson (R-WY) &
Senator Pete V. Domenici (R-NM),
October 21, 1983**

"That bill [H. R. 3400] chooses the most expensive strategy for accomplishing reductions—mandated scrubbers. Furthermore, the exorbitant costs of the program are then spread over the entire nation, not just those who are contributing to the problem. These two elements of the bill are poor public policy and have particularly serious implications in the West. The Western states, because of the mandates of the Clean Air Act and because of the desire to maintain the clean air in the region, have required stringent emissions controls at the State level for many years. The consumers in the West pay a high price for those controls, a price, we might add, which they are willing to pay. . . . To even suggest that the consumers in our States help foot the bill to clean up the midwestern sources seems wholly unfair."

**Senator Daniel Patrick Moynihan (D-NY),
February 7, 1984**

"Several of the acid rain bills introduced recently have contained provisions to tax electricity to pay for emission controls. I cannot endorse a scheme that taxes electricity in New York to pay for the installation of pollution control equipment in the Midwest. A tax that falls on electricity alone is inefficient and inequitable. The average cost of electricity for residential consumers in New York is 10.2 cents per kilowatt hour. It is 6.7 cents per kilowatt in Ohio. Why should the tax be on electricity? Any economist will tell you that you tax something if you want less of it. A tax that falls on electricity alone is inefficient and inequitable."

**Senator William Proxmire (D-WI),
February 25, 1985**

"I am pleased to introduce [with Senator Humphrey (R-NH)] the Acid Deposition and Sulfur Loadings Act. It is divided into two phases with a three year period in between for evaluation of the results. By dividing the reductions into two phases utilities and other large polluters can use cheaper controls such as coal washing and fuel switching. . . . This flexible, cost-effective approach is the heart of our bill."

Senator Max Baucus [D-MT], New York Times, December 9, 1984

"But the real battle over acid rain will be fought over the question: Who should pay for acid rain controls? Either the polluters will pay or everyone will, through a Federal tax on electricity. . . Acid rain does cross state lines, and sulfur dioxide from one state may cause acid rain in another state. But is that any reason to tax citizens in states that aren't contributing to the problem?

Opinion polls say no. The overwhelming majority think the polluters should pay. Not all states have made the same progress in controlling air pollution. Cost sharing programs will reward the states that have done the least.

According to the Congressional Office of Technology Assessment, coal-fired utilities in Montana produce very little sulfur dioxide for every unit of electric power they produce. Similarly, utilities in New York State have a relatively low average emission rate, and New York has just passed a law to cut those emissions by one-third more. Montana and New York have cleaned up at their own expense. If every state's utilities were as clean, the overall sulfur dioxide goals in most acid rain bills would already have been met.

It's simply unfair to ask consumers in Montana or New York, who've already paid their share of pollution control costs, to pay for cleanup in other regions."

Rep. Jim Florio (D-NJ), before the Public Utilities Communicators Association, May 25, 1984

"... the Cheney-Udall bill offers utilities flexibility by allowing them to choose the most efficient method of emission reduction on a case-by-case basis. Given this flexibility, I believe utilities and other industries would be able to attain emission control without transferring an undue economic burden on the consumer. Consumers should not be required to pay billions of dollars for the installation of costly scrubbers, when other less expensive alternatives such as fuel switching, emissions trading and coal washing are available."

**Rep. Patricia Schroeder (D-CO),
June 1984**

"Scrubbers are the most expensive method and some alternatives including emissions trading, fuel switching and coal washing are cheaper. The Udall-Cheney proposal does not impose a nationwide tax and recognizes past emission cleanup by utilities. The primary cost of the clean up should be born by those who pollute, not by the utility consumer or the taxpayer."

**Rep. Morris Udall, (D-AZ), Introduction
of H. R. 2679, June 5, 1985**

"One thing that came out of last year's debate on acid rain, is that polluters ought to pay for clean up of their industry. . . . By requiring industries to invest the money to clean up their sulfur dioxide emissions, you get some guarantee that this will be done by the most cost-effective means. I support the polluter-pay concept. I think most of the American people do too."

Rep. Jim Bates, (D-CA) October 18, 1983

"I am concerned that my constituents in San Diego will have to pay for pollution generated in the midwestern United States. Rather than charge San Diego utilities one mil per kilowatt hour user fee to reduce the sulfur dioxide levels in the midwest, the costs would be more appropriately placed on those who generate the pollution."

**Representative Dick Cheney (R-WY)
June 5, 1985**

"...a sensible alternative to the forced-scrubber approach... is a freedom-of-choice bill. Local utilities will decide, based upon their special circumstances, how best to reduce their sulfur dioxide emissions. This will encourage the use of inexpensive, immediately available, and innovative solutions. It will also encourage future innovation in control approaches and the development of new ways to burn both low and high sulfur coal rather than locking us into old inefficient technologies."

Chambers of Commerce

CALIFORNIA STATE CHAMBER OF COMMERCE, September 14, 1984

"The California Chamber of Commerce supports the position that, if any federal acid rain legislation is to be enacted, it should permit affected utilities a free choice in selecting the methods of achieving reduced emission levels, and it should not place the cost of such pollution controls on persons or organizations which are not directly involved in the activity creating the pollution."

HOUSTON (TEXAS) CHAMBER OF COMMERCE—August 14, 1984

"If legislation is to be enacted, the Houston Chamber of Commerce is opposed to any type of legislation which would share the cost of acid rain controls by burdening the Gulf Coast region, which is currently bearing the cost of operating well-controlled sources. This type of cost sharing would represent a Houston area subsidy to areas geographically removed from the Gulf Coast at the expense of the Gulf Coast economy."

BILLINGS (MONTANA) CHAMBER OF COMMERCE—May 2, 1984

"We are very concerned with some legislative proposals which would dictate the method of emission control to be used by utility plants and then tax all utility rate payers to pay the cost of this emission control. Instead, the Chamber believes affected plants should have the choice of deciding how to meet emission standards and then passing the cost to their ratepayers. Such an approach would be more fair in that those affected would pay, rather than requiring people, like Montanans, who have already paid for their clean air to also pay to clean up other people's air."

**DALLAS CHAMBER OF COMMERCE—
February 17, 1984**

"The Dallas Chamber of Commerce recognizes that current scientific evidence suggests that there is a relationship between manmade air emissions and acid deposition. Many believe that there is a need for enactment of acid rain deposition legislation. However, it is important that if such legislation is enacted that it does not unfairly penalize the utilities and businesses which are not major contributors to the acid deposition problem. Mandatory scrubbing or taxation of utilities and businesses which do not contribute to the acid deposition problem should not be considered."

Associations and Utilities

GENERAL FEDERATION OF WOMEN'S CLUBS, August 1983

"General Federation of Women's Clubs (GFWC) does believe that something must be done to correct the acid rain problem. And that the way to correct the problem is that coal users should be allowed the freedom of choice when complying with the environmental standards."

PENNSYLVANIA ENVIRONMENTAL COUNCIL, (Philadelphia) May, 1984

"We believe that there should be a 12 million ton SO₂ reduction and a 4 million ton NO_x reduction in the 48 contiguous states. The method of reduction should be left up to the various industries with those industries bearing the cost of the reduction."

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, June, 1984

"Chemical engineers believe that if an emission reduction program is required, it should be based on the most cost-effective control technologies applicable to the specific facility (system) in question. That is, we advocate that the Congress not mandate the technological means by which emission reductions are achieved. We believe that no single technical choice is best for all applications. Therefore, if Congress decides to enact acid rain legislation, it should permit organizations to freely adopt the most economic technologically available alternative, including fuel switching to achieve the desired objective. Further, any legislation adopted by the Congress should provide incentives for industry to adopt advanced technologies for precombustion control to achieve system-wide objectives."

COUNCIL OF INDUSTRIAL BOILER OWNERS, November, 1983

"While CIBO believes that the scientific evidence does not support the need for controls or the specific provisions of this legislation, any control strategy should include the most equitable cost-effective solutions."

**STATEMENT OF THE WESTERN
REGIONAL COUNCIL, Before Senate
Committee on Environment and Public
Works, November 17, 1983**

"Major initial reductions in sulfur dioxide emissions from coal fired power plants can be achieved through coal washing, fuel blending, and use of low sulfur fuels. Technological controls are expensive to install and just as costly to operate. They often merely transform one environmental problem to another. Sources should be allowed to decide how best they can meet emission reductions at the lowest possible cost."

**NATIONAL ASSOCIATION OF
COUNTIES, March 3, 1985**

"NACO opposes the general taxing of energy utilities that does not reflect the achievements already made towards abatement; and supports the principle of polluter pays."

**SOUTHWEST REGIONAL ENERGY
COUNCIL (Texas, Louisiana, Arkansas,
New Mexico, Oklahoma), RESOLUTION
ON ACID RAIN, April 26, 1984**

"Congress should adopt an acid rain control program which: 1. Encourages the most cost-effective emission reductions. 2. Provides for initial control efforts to reduce acid rain related emissions applied where demonstrated significant acid rain problems exist or where damage has occurred. 3. Recognizes unique regional distinctions, including emissions reductions and clean-up already achieved. 4. Does not impose nation-wide taxes which penalize all states while providing regional benefits in other parts of the nation. 5. Provides for resolution of scientific uncertainties through an aggressive research program which must underlie development of a rational acid rain strategy."

**TENNESSEE VALLEY AUTHORITY
BEFORE THE COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS,
U.S. SENATE, February 9, 1983**

"Simply put, our position is...SO₂ reductions should be allocated to the States proportionally to their total SO₂ emissions for the 1980 base year. States should have flexibility in allocating their required emissions reductions. TVA believes in the principle that the polluter should pay, and we practice what we preach. The costs of further reduction should be borne by the polluters and thus passed on to consumers. Maximum flexibility should be given to emitters to select the most cost-effective way to reduce their emissions."

**MONTANA-DAKOTA UTILITIES
COMPANY, August 9, 1983**

"Emissions reductions should be achieved by the most economical means available to particular utilities and regions and should not be achieved by a nationally mandated technological fix (scrubbers). Basic responsibility for emission reductions should fall upon those whose emission productions are greater and directly contribute to the problem."

**AMERICAN PUBLIC POWER
ASSOCIATION, February, 1985**

"The APPA, the national service organization representing over 1,750 local publicly owned electric utilities throughout the country, endorses enactment of legislation which meets the criteria of effectiveness, economy, and equality...and urges the Congress to reject schemes based upon electricity taxes, or which ignore least-cost options..."

Academia

PROFESSOR JOHN G. MYERS,
(Southern Illinois University),
March 28, 1984

"If any acid rain legislation is made into law, it should be designed to achieve its objectives at minimum cost to the nation. An effective program will inevitably be very costly. We should not make it more expensive than it need be. Displaced miners can be compensated at much less expense than the added cost of a forced scrubbing program."

G. HENRY M. SCHULER, Director of the
Bartlett Program in Energy Security
Studies at Georgetown University's Center
for Strategic and International Studies,
November, 1984

"... Consumption [of coal] is inhibited by fears of acid rain, even though that problem could be vastly ameliorated at reasonable cost by prompt expansion of low sulfur coal production while longer-term technologies for extracting sulfur are developed and implemented. Although that so-called "least cost" approach would serve the long term national interest in energy security, it is blocked by the regional interest of legislators representing areas producing high-sulfur coal who fear the immediate political impact of losing the market share and jobs."

**DR. PAUL PORTNEY, RESOURCES FOR
THE FUTURE, October 12, 1983**

"...the forced scrubbing approach is no more than a domestic tariff on low-sulfur coal designed to protect those who own and mine high-sulfur coal. While economists may disagree on much, they are in nearly unanimous agreement on the potentially very harmful effects of such tariffs. The forced scrubbing approach would offer job protection to some, but only at the expense of even greater job losses to others and the additional loss of \$1 billion per year. If emulated, such a policy eventually would redound to the harm of even those it would in the short-run protect. Since there are a number of ways the U.S. could take advantage of its vast reserves of low-sulfur coal, while at the same time assisting those harmed by such an approach, the way seems clear."

**PUBLIC INTEREST ECONOMICS
FOUNDATION, May 2, 1984**

"Any acid deposition control legislation that mandated the installation of a specific type of control technology, such as scrubbers, would be wasteful...so would legislation that provided subsidies or cost sharing provisions that would create artificial incentives to sources to choose scrubbers. Rather, each source should be free to choose the lowest-cost method for meeting emission reductions, given its particular circumstances."